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FIELD INVESTIGATIONS OF UNCONTROLLED HAZARDOUS WASTE SITES

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TASK REPORT TO THE ENVIRONMENTAL PROTECTION AGENCY CONTRACT NO. 68-01-6056

CHLORINATED SOLVENT CONTAMINATION
of the
GROUNDWATER
East Central Woburn, Massachusetts

December 8, 1981 TDD No. F1-8110-01

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TDD # F1-8110-01

Chlorinated Solvent Contamination of the

Groundwater

East Central Woburn, Massachusetts

The following Region 1 Field Investigation Team members made major contributions to this study in the capacities noted:

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SECTION 1 - INTRODUCTION

In May 1979, several chlorinated solvents were detected by the Massachusetts Department of Environmental Quality Engineering (DEQE) in two of the City of Woburn's municipal drinking water wells. As a result, these wells ("G" and "H") were shut down forcing Woburn to use MDC water to supplement its other groundwater wells located near Horn Pond. The levels of contamination detected prior to shutdown and immediately after shutdown are given in Table 1-1.

Table 1-1

Analyses of Water from Wells
"G" AND "H", Woburn, Massachusetts (ppb)

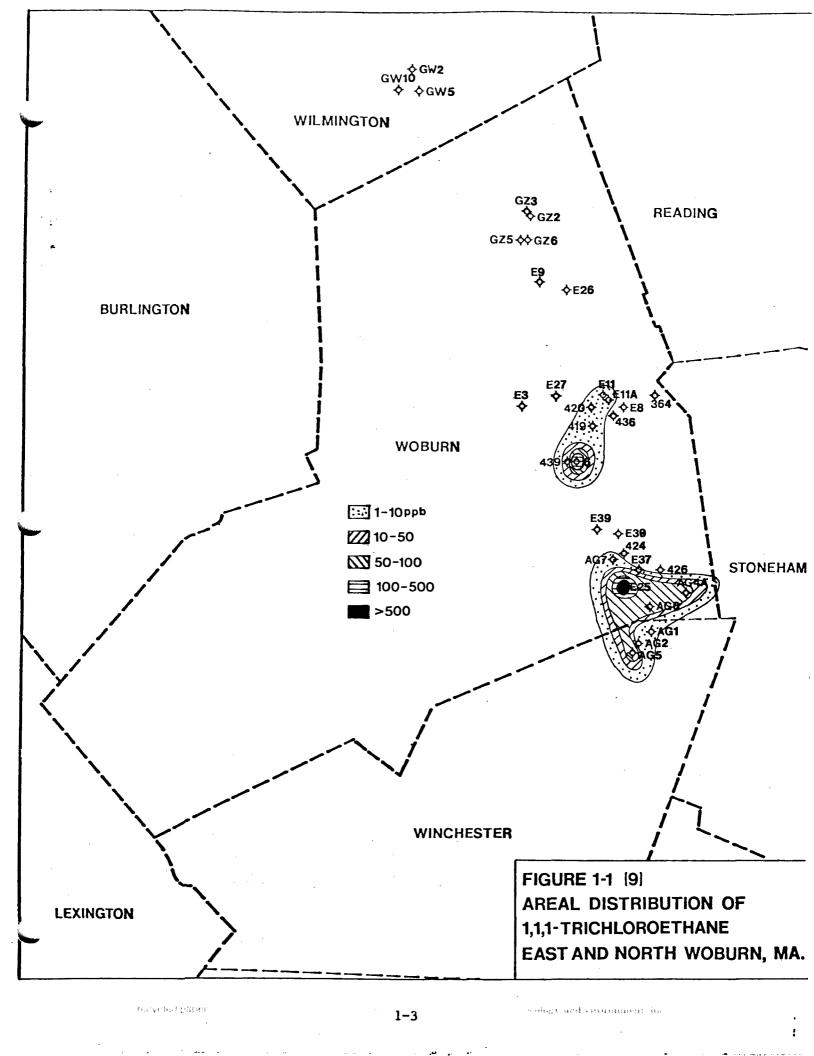
		"G" Well	_			
	5/21/79	7/24/79	7/24/79	9/25/79	9/28/79	2/26/81
	(1)	(2)	(2)	(3)	(3)	(4)
		(D	upl)			
l,1,1-trichloroethane	1	28	28	ND	10	ND
1,2-trans-dichloroethylene	e ND	0	0	ND	11	14
tetrachloroethylene	21	18	13	13	43	36
trichloroethylene	267	208	236	184	400	210
chloroform	12	ND	ND	ND	ND	ND
trichlorotrifluoroethane	ND	22	23	ND	ND	ND
		Harlf ex. 1.1				
		"H" Well 5/21/79		./79	9/26/79	2/26/81
		(1)	(2		(3)	(4)
1,1,1-trichloroethane		ND	N	TD	2	ND
1,2-trans-dichloroethylene	2	ND	N	ID	ND	14
tetrachloroethylene		18	2	26	9	41
trichloroethylene		118	18	8	63	73
chloroform		1	N	ID	ND	ND
trichlorotrifluoroethane		ND	2	.3	ND	ND

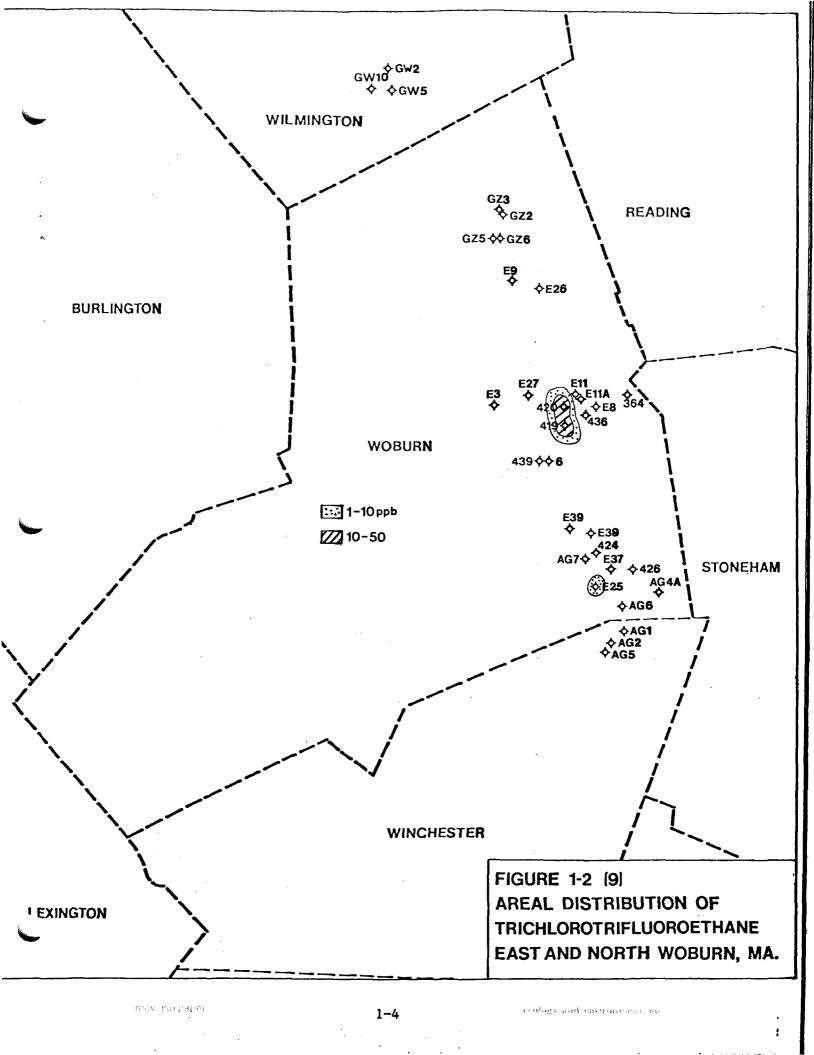
1. Introduction - continued

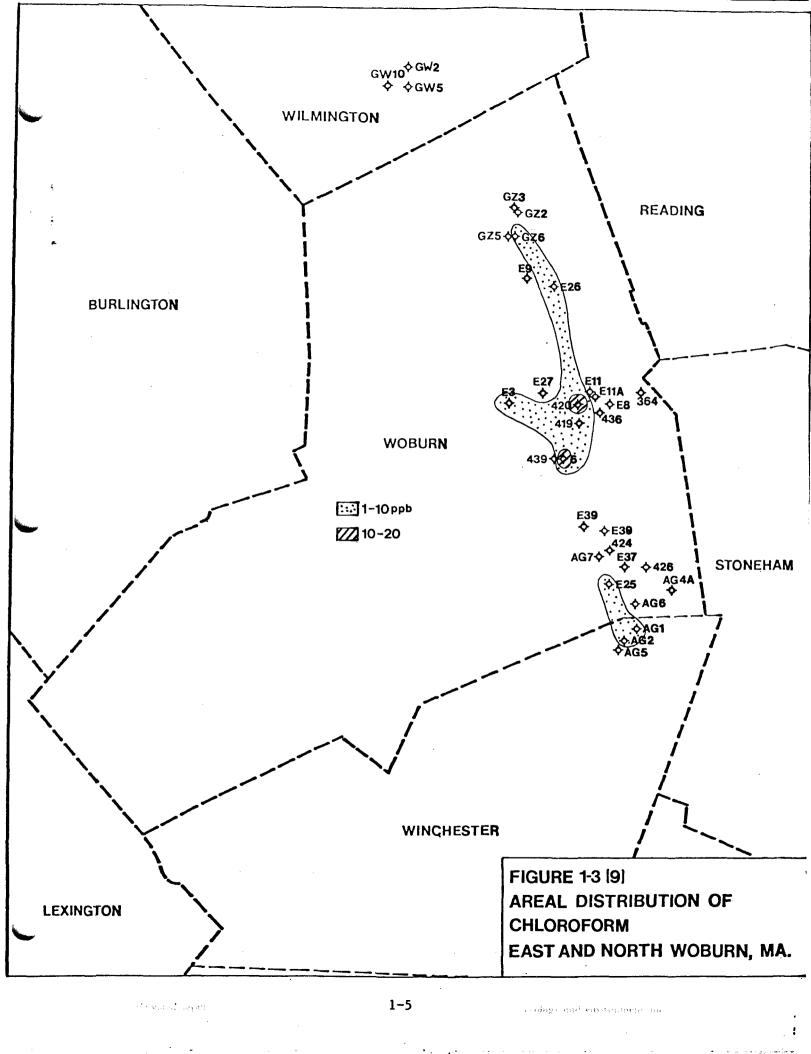
As a result of the detected contamination, the Ecology and Environment, Inc., Region I Field Investigation Team (E & E FIT) was tasked to perform preliminary assessments and site investigations of fourteen potential sources in East and North Woburn (5, 6, 7). These studies indicated that a number of contaminants were being disposed of into the City of Woburn sewer system by several industries. However, no direct sources of the well contamination were discovered.

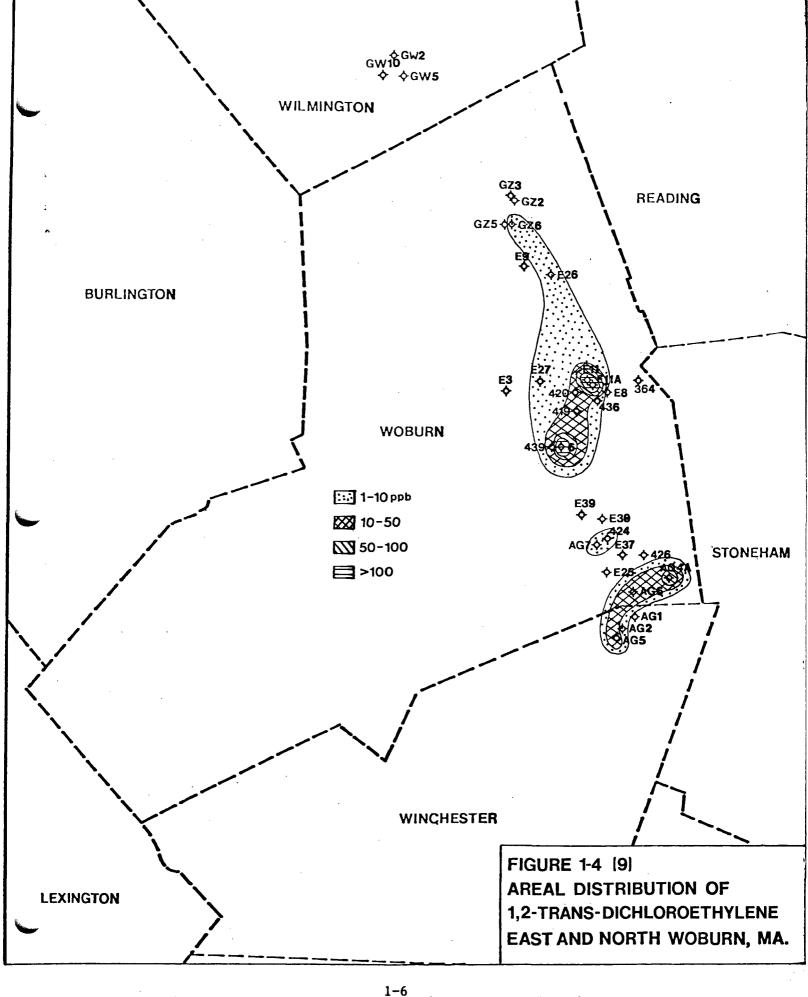
E & E was then tasked to perform a comprehensive hydrogeologic investigation and groundwater quality evaluation of a ten square mile portion of East and North Woburn (8, 9). From this study, the known areal extent of contamination for the compounds present in wells "G" and "H" was determined (Figures 1-1 to 1-6).

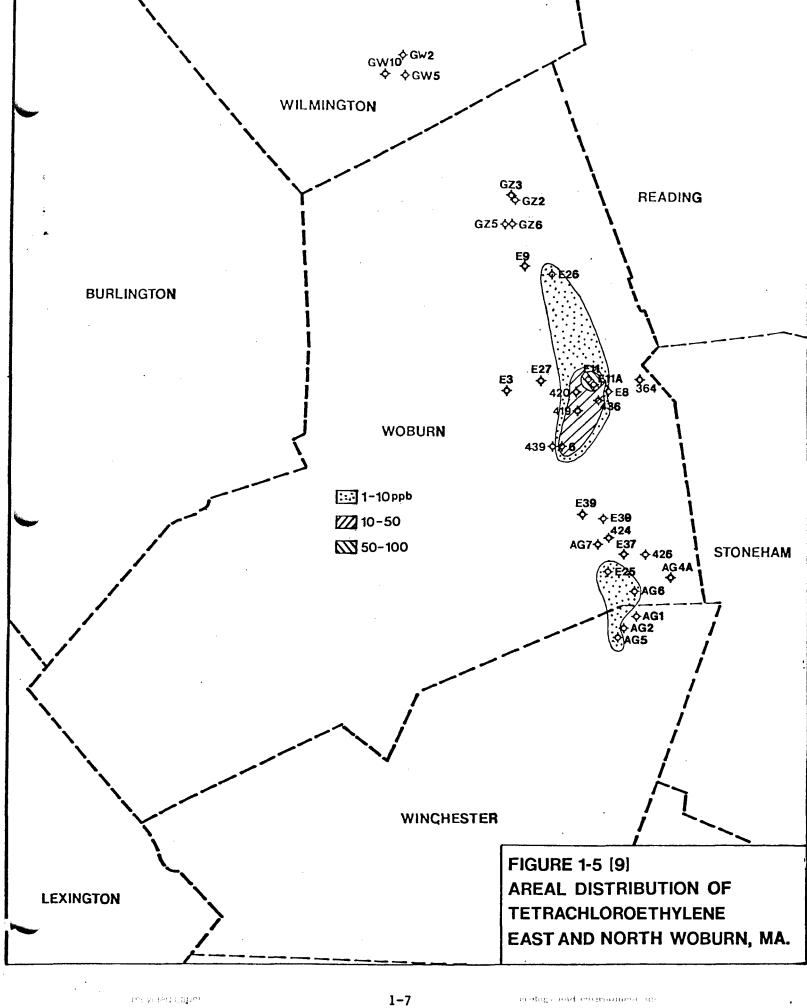
To supplement existing data, twenty-two additional monitoring wells were installed, seven of which are located near and upgradient of the known contamination plumes affecting wells "G" and "H". The results of groundwater analyses for these seven wells and other appropriately situated accessible wells plus bedrock studies of the area are the subject of this report.

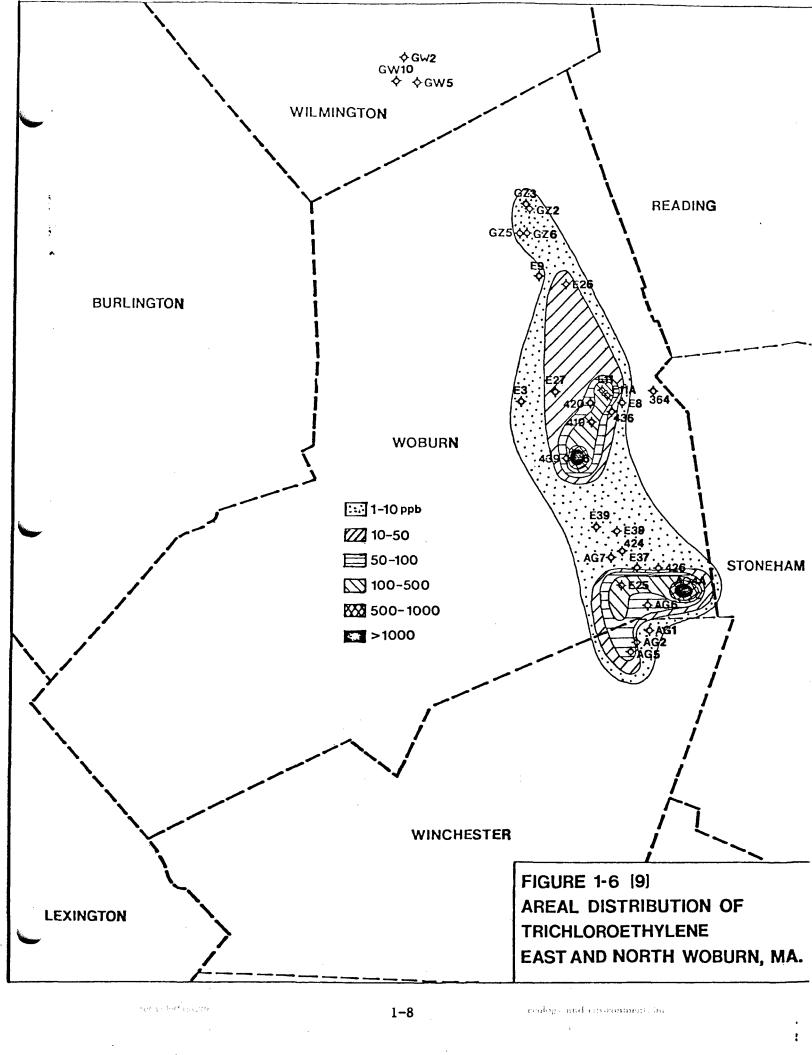












SECTION 2 - DESCRIPTION OF THE STUDY AREA

2.1 INTRODUCTION

Figures 2-1 and 2-2 show the one square mile area covered by this study. The base map (Figure 2-2) was constructed from aerial photographs taken on 7 May 1979. A description of the portions of Woburn located north and south of the study area can be found in References 8 and 10.

A number of commercial and industrial operations are located within the study area. Those which are located near to and upgradient of the plumes affecting wells "G" and "H" are labelled on Figure 2-2 and identified in the key to that figure. Several of the existing operations very likely use one or more of the chlorinated solvents present in wells "G" and "H".

2.2 WELL AND BOREHOLE LOCATIONS

Thirty-five wells and boreholes have been identified within the study area and are identified on Figure 2-2. Table 2-1 gives the relevant parameters for these wells. Logs for the newly installed EPA and MDC wells are given in Appendix A. Logs for all other wells may be found in Reference 8. E 43 is the location of a spring issuing from a bedrock outcrop adjacent to Route 128.

2.3 SURFACE DRAINAGE

Surface drainage in the study area flows from north to south and consists of the Aberjona River with a few minor tributaries. There is a significant wetlands area associated with the Aberjona in the southwest quadrant of the area. See Figure 2-2 for a map of surface drainage.

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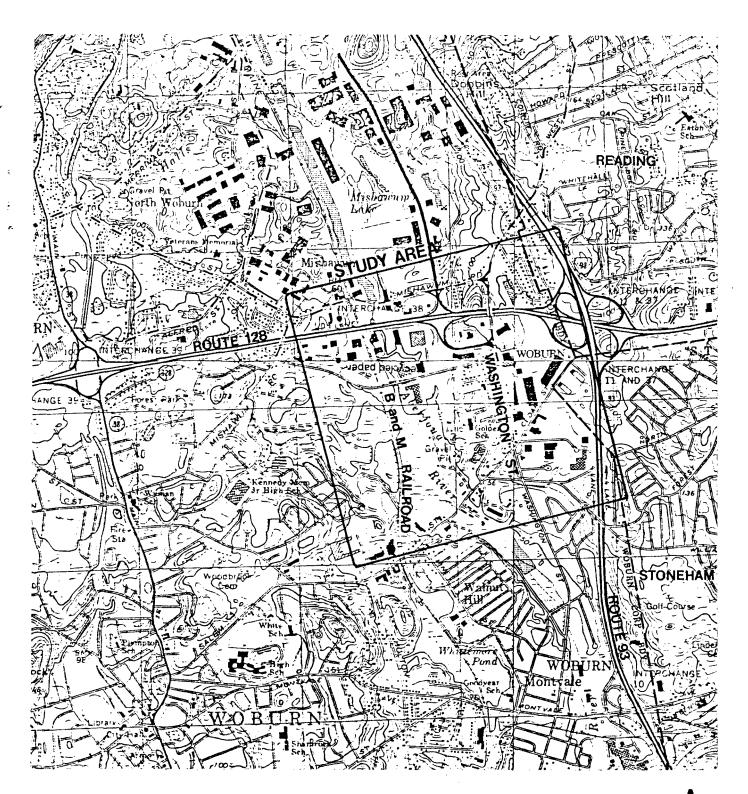


FIGURE 2-1: LOCUS MAP
EAST CENTRAL WOBURN STUDY AREA [11]

SQALE 1:25000

KEY

- A. AVA Warehouse
- B. Bachman Distributing Co.-Food distribution
- C. Allied Van Lines
- D. Woburn Mall Commercial
- E. Arlwood, Inc. Wood/Metal doors, hardware
- F. Brodie, Inc. Industrial trucks, tractors
- G. Brodie, inc. Industrial trucks, tractors
- H. Post Office
- I. Bradlee's Commercial
- J. Celotex Corporation Warehouse
- K. Economics Lab, Inc. Distributor of soap and cleaning compounds
- L. ADAP/Kamco. Commercial, auto parts
- M. Waterbed Warehouse Commercial
- N. Charrette Commercial, art supplies
- O. Woburn Foreign Motors
- P. Hogan Tire Company Tire distributor
- Q. Bliss marine Boating equipment
- R. Hurlbert Datsun Automobile sales and repair
- s. Cummings Industrial Centers Offices
- T. Northern Research and Engineering Corporation
- U. Continental Metal Products Hospital equipment
- V. Cummings Industrial Centers Offices
- W. Cummings Industrial Centers Offices
- X. Interstate Industrial Uniform Rental
- Y. Metro Siding and Roofing
- Z. W. R. Grace Food wrapping equipment
- AA. Hemingway Transportation, Inc. General commodities trucking
- BB. Cummings Industrial Centers Offices
- CC. Cummings Industrial Centers Offices
- DD. Cummings Industrial Centers Offices
- EE. Cummings Industrial Centers Offices
- FF. McKesson and Robbins Drug Company
- GG. 99 Restaurant
- HH. Koala Inn
- II. New England Plastics Plastics manufacturing
- JJ. Mirra Construction Company, Inc.
- KK. Independent Tallow Company

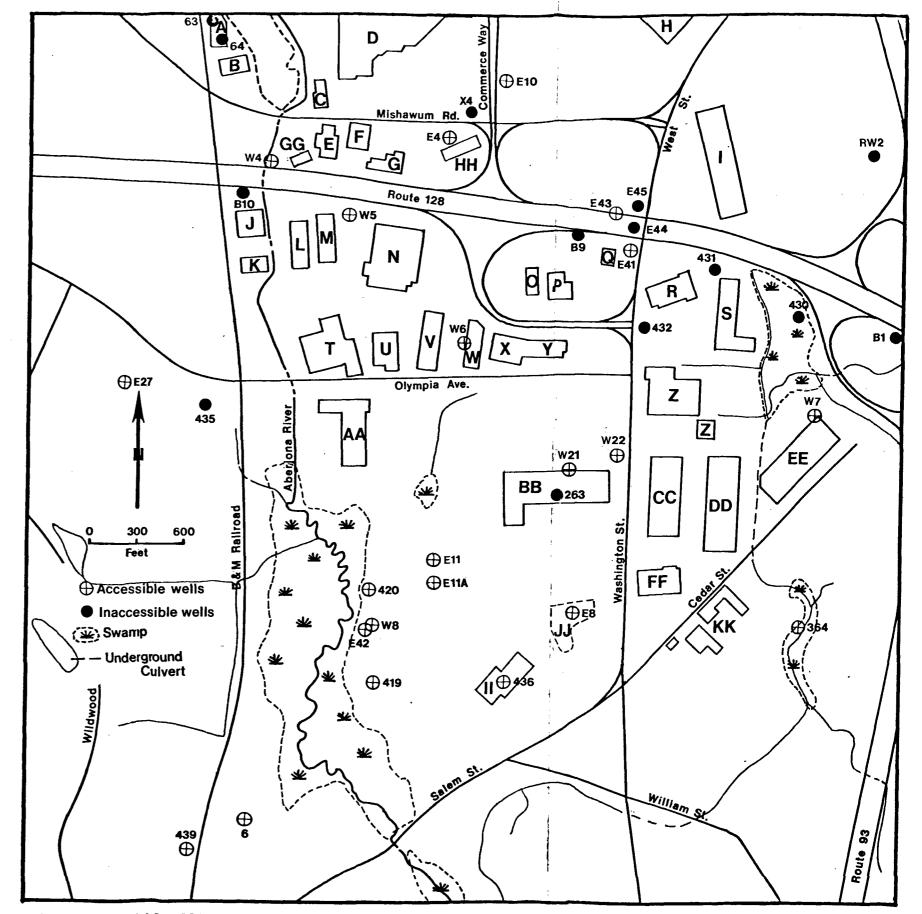


FIGURE 2-2: BASE MAP FOR THE EAST CENTRAL WOBURN STUDY AREA

Parameters for Wells and Boreholes in East Central Woburn, Massachusetts (8, 12)

in East Central Woburn, Massachusetts (8, 12)											
		Well Person Person Person To						Water		Accessible	
11 "	11 1 6	Year	Diameter	Depth		Depth to	Level	Date		for	
Well #	Installed for	Installed	(in.)	<u>(ft)</u>	<u>Use</u>	Bedrock(ft)	<u>(ft.)</u>	Measured	Use	Sampling	
_		1050	0.1	5 1			-	150			
6	J. J. Riley	1958	24	51	W		5	/58	N	Х	
63	Stauffer Chem.	1936	18	83	U		6		N	-	
64	Stauffer Chem	1937	24	78	W		6		N	-	
263	Johnson Bros.	1958	8	364	W	60			I	- .	
364	Independent Tallow		24	24	W		8		N	X	
419"G"	Woburn	1967	24	88	W		1		P	X	
420"H"	Woburn	1964	24	84	W		1		P	X	
430	Salada Tea Co.	1958	2	15	T		0	12/38	U	-	
431	Salada Tea Co.	1958	2	5	T		3		U	-	
432	Salada Tea Co.	1958	2	7	T		0		U	_	
435	Lamont	1969	2	86	T		6	5/69	U	-	
436	N.E. Plastics	1962	Unk	358	W	38	15	2/62	N	X	
439	J. J. Riley	1945	Unk	35	W		5		N	X	
E 4	Koala Inn	1980	6	600	U		8	10/81	U	X	
E 8	Mirra Const.	Unk	Unk	Unk	W				N	X	
E10	Woburn Nat'l Bk.	Unk	2	15	W				Ü	X	
E11	Mass Rifle	Unk	Unk	Unk	W				R	X	
EllA	Crowley	Unk	Unk	Unk	W				R	X	
E27	Rohtstein	Unk	Unk	Unk	W				N	X	
E41	MDC	1981	2	54	M	24	26	10/81	Ü	X	
E42	Woburn	Unk	2	27	T		2	10/81	Ū	X	
E44	MDC	1981	-	36	В	8	10	8/81	_		
E45	MDC	1981	_	54	В	14	23	8/81	_	_	
B 1	MDPW	1955	-	37	В		14	6/55	-	_	
В 9	MDPW	1949	_	10	В		·		_	-	
B10	MDPW	1949	_	. 96	В				-	_	
X 4	Woburn	Unk	Unk	21	T				Ū		
RW2	E. A. Porter	1932	36	9	U				U	_	
W 4	EPA	1981	2	91	М	84	5	10/81	Ū	X	
w 5	EPA	1981	2	66	M	56	3	10/81	Ū	X	
w 6	EPA	1981	2	96	M	86	8	10/81	Ŭ	X	
W 7	EPA	1981	2	28	M	18	4	10/81	Ū	X	
w 8	EPA	1981	2	128	M	118	2	10/81	Ŭ	X	
W21	EPA	1981	2	31	M	21	19	10/81	Ū	X	
W22	EPA	1981	2	44	M	36	26	10/81	Ū	X	
·	-	— -						· - •			

W = Water withdrawal

B = Borehole

T = Test

U = Unused

I = Irrigation
P = Public supply

M = Monitoring

N = Industrial R = Domestic (-)= Unavailable or Not applicable

2.4 SURFACE TOPOGRAPHY

Figure 2-3 is a map of the surface topography of the study area. The primary sources of data for this map were the United States Geological Survey Topographic Maps for the Lexington, Boston North, Wilmington and Reading, Massachusetts Quadrangles. Some modifications were made as a result of field investigations performed by E & E during the course of this study. All gravel pits present in the 8 May 1979 aerial photographs have been added to this map.

The western portion of the study area is topographically low because it is occupied by the Aberjona River and its associated flood plain. The surface elevations rise rapidly on both sides of the river valley. The surface configuration reflects the underlying bedrock surface. A fault trending N-S is present under the Aberjona River Valley which very likely was controlled by this fault. Many bedrock outcrops are present in the highlands to the east of the river valley.

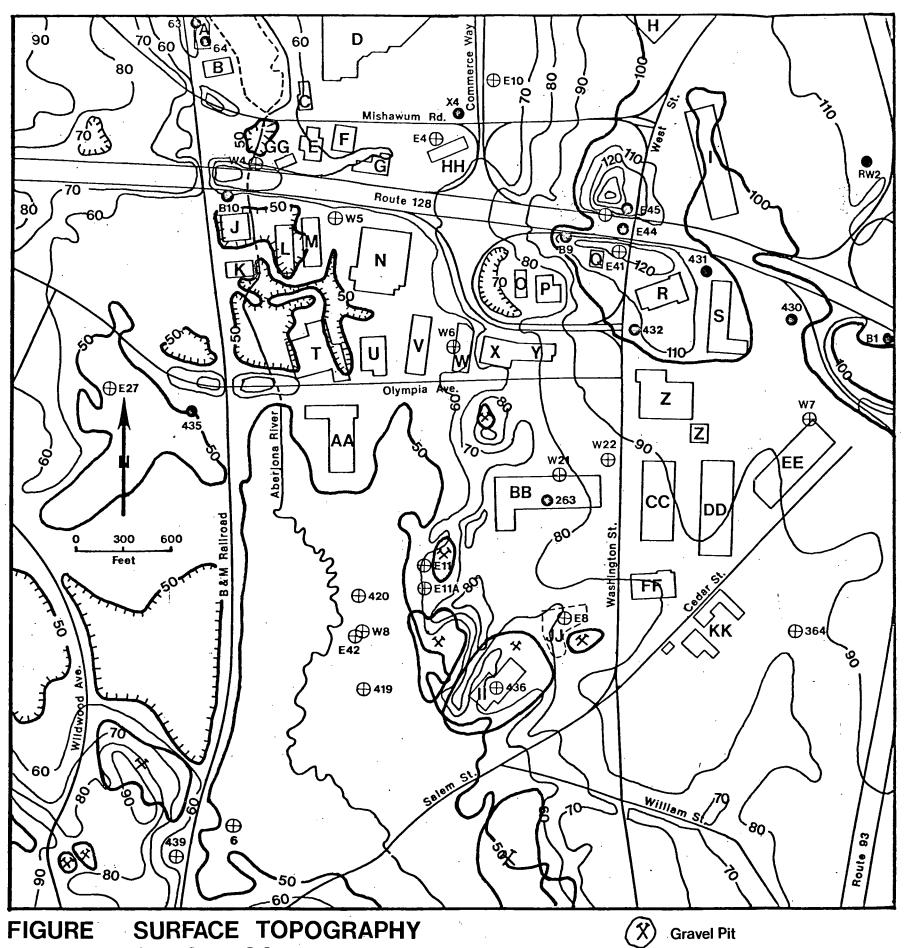
2.5 WATER TABLE CONFIGURATION AND GROUNDWATER FLOW DIRECTIONS

Figure 2-4 is a contour map of the water table showing the directions of groundwater flow. This map is reproduced from an earlier E & E report (8) with minor modifications resulting from incorporation of water table measurements from the newly installed EPA and MDC wells.

The water table configuration resembles the ground surface and bedrock surface configurations for the study area. Groundwater flows from the west and east portions of the study area toward the Aberjona River Valley and then to the south as shown in Figure 2-4.

2.6 BEDROCK SURFACE CONFIGURATION

A contour map of the bedrock surface is presented in Figure 2-5. This map is reproduced from an earlier E & E report (8) with minor modifications based on bedrock corings performed during the installation of monitoring wells within the study area.



2-3:

10 FOOT CONTOUR INTERVAL, MSL

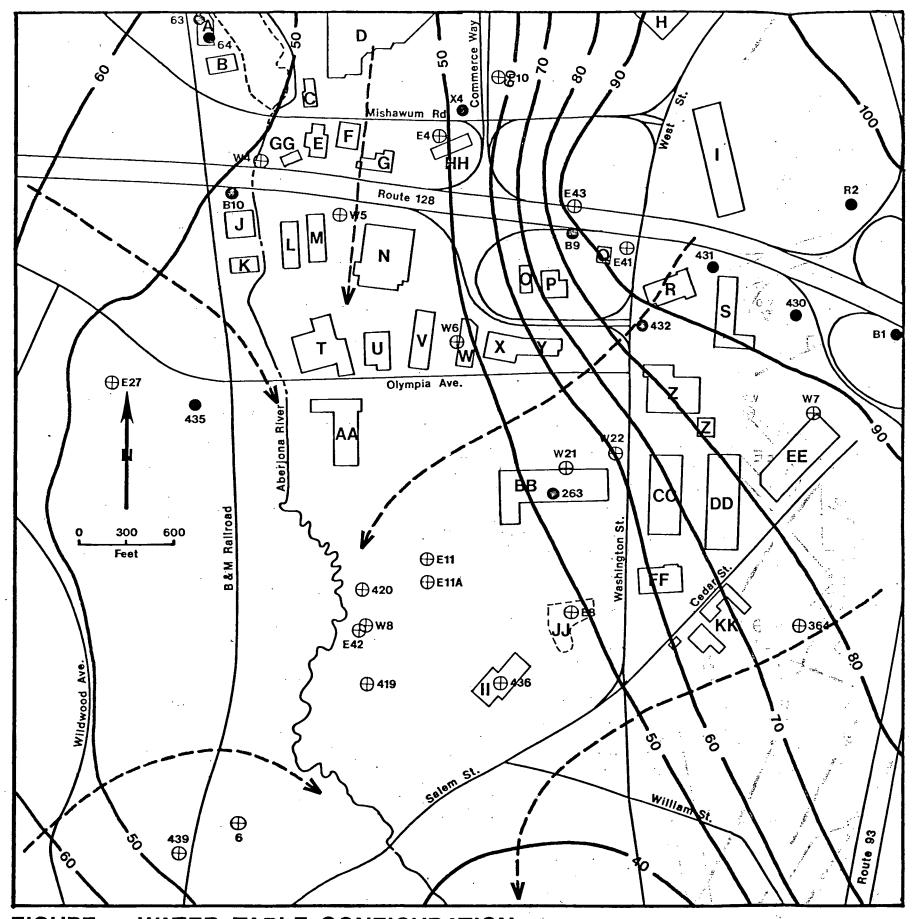


FIGURE 2-4:

WATER TABLE CONFIGURATION 10 FOOT CONTOUR INTERVAL, MSL

Groundwater Flow MODE 19 196 **Direction**

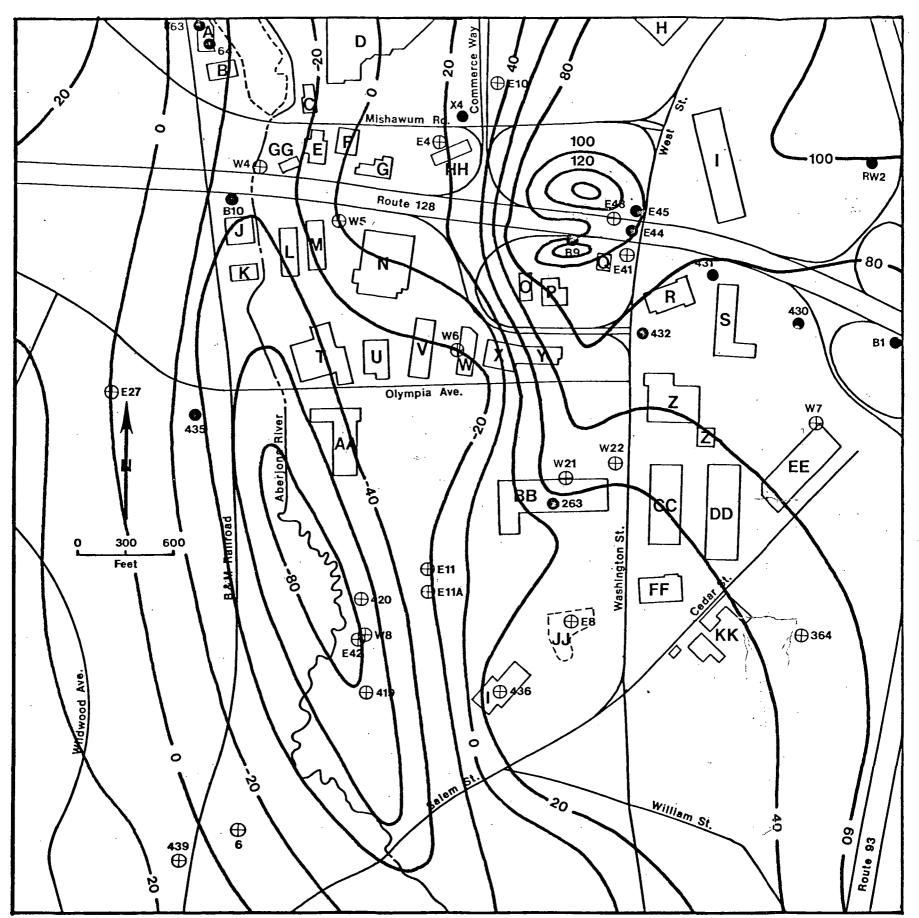


FIGURE BEDROCK SURFACE CONFIGURATION 2-5: 20 FOOT CONTOUR INTERVAL, MSL

¥

2.6 Bedrock Surface Configuration - continued

The bedrock surface is dominated by a N-S trending trench with the rock surface rising rapidly to the east and west. Wells "G" and "H" are located near the deepest part of the trench. A bedrock high is present just south of the study area and may act as a barrier to contaminant migration southward from Wells "G" and "H".

2.7 BEDROCK GEOLOGY

Bedrock cores were obtained during drilling of wells W-4, 5, 6, 7, 8, 21 and 22. These cores indicate that the primary rock type in the area is Salem Gabbrodiorite. The core for well W-4 consists of Dedham Granodiorite and most likely represents an isolated lens of granodiorite within the gabbrodiorite. All of the rock cores show extensive fracturing, and wells W-4, 8 and 22 apparently intersect faults. In order to determine the primary directions of fracturing and faulting, a survey of available outcrops is being performed, and the orientation of planar features is being plotted using a Brunton pocket transit followed by stereographic projection. All measurements taken to date are plotted on Figure 2-6 and contoured on Figures 2-7 and 2-8. The contour diagram of joint surfaces (Figure 2-7) indicates some preferred orientation striking N75°W and dipping from 60°SW to 15°NE. In general, the joint surfaces have a wide range of orientations and very likely were formed as shrinkage cracks during the cooling of the gabbrodiorite intrusion. contour diagram of the fault surfaces shows a distinct orientation ** striking NO-30°E and dipping steeply (85°NW).

Thin sections have been made of the bedrock cores obtained during the monitoring well installations. Preliminary evaluation of these sections confirms the presence of faults near wells W-4, 5, 8, 21 and 22. Considerable cataclasis (deformation resulting from fracturing and rotation of mineral grains) and alteration minerals commonly associated with faulting are present in the sections. There appears to be a major fault striking N-S under the Aberjona River Valley and several associated faults striking N-S to N30°E within the study area.

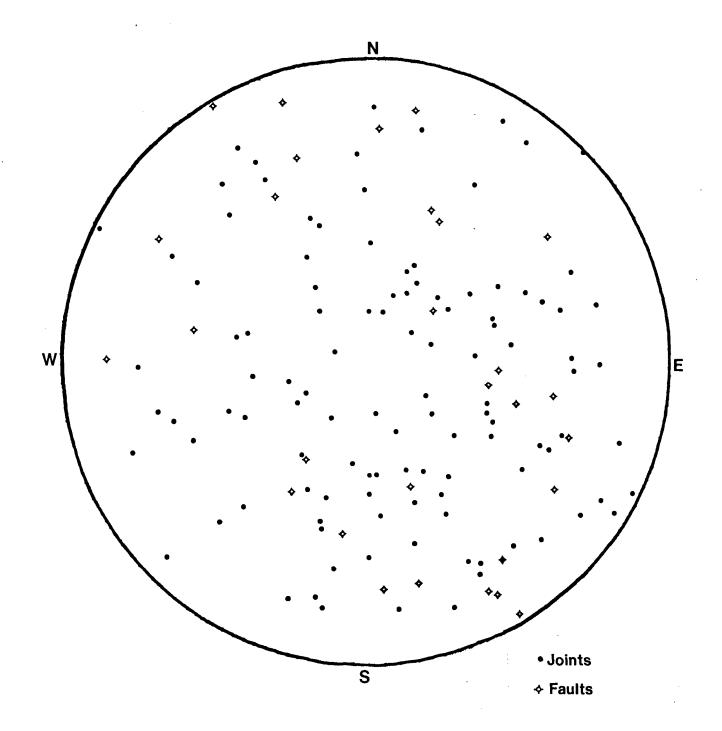


FIGURE 2-6: STEREOGRAPHIC PROJECTION PLOTS OF THE POLES
TO 111 JOINT AND 29 FAULT SURFACES
EAST CENTRAL WOBURN, MA.

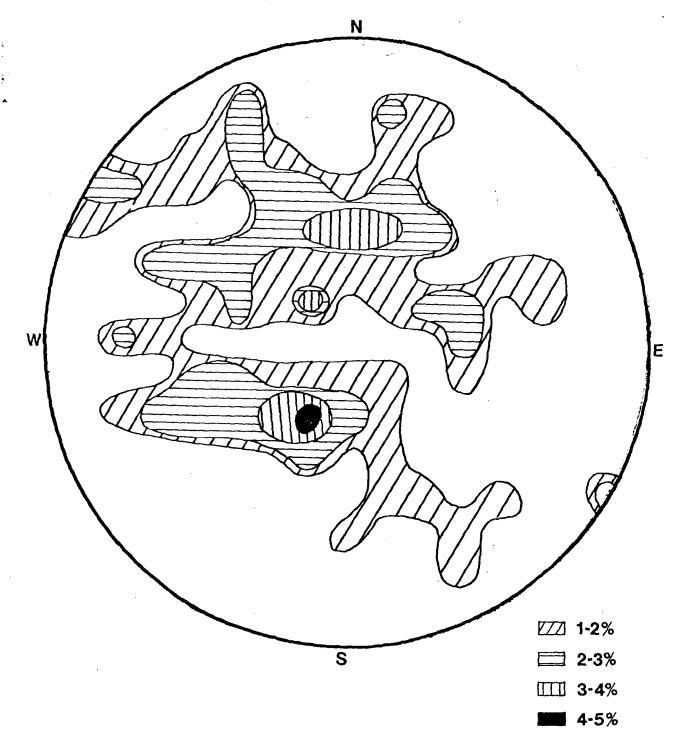


FIGURE 2-7: CONTOUR DIAGRAM OF THE POLES TO 111 BEDROCK
JOINTS- EAST CENTRAL WOBURN, MA.

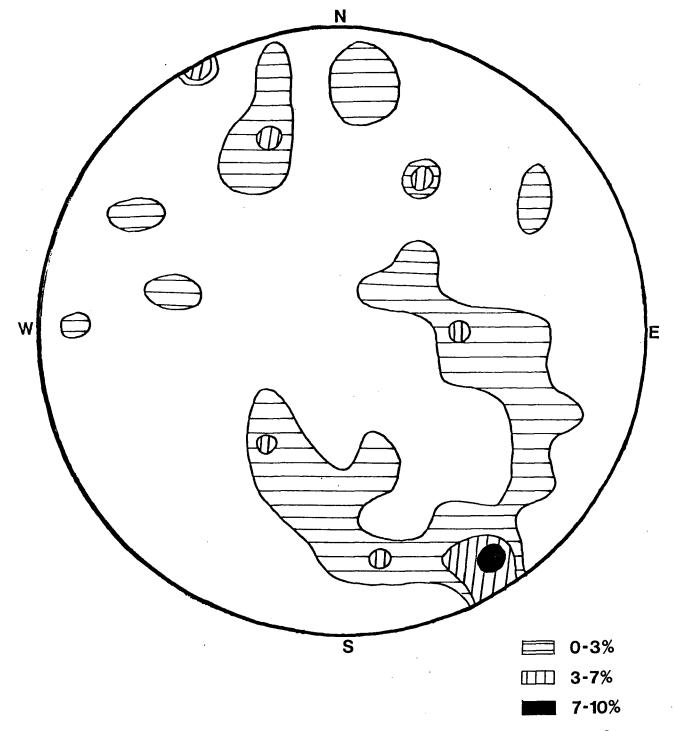


FIGURE 2-8: CONTOUR DIAGRAM OF THE POLES TO 29 FAULTS EAST CENTRAL WOBURN, MA.

2-12

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2.7 Bedrock Geology - continued

The final report on the geology, hydrogeology and groundwater quality of East and North Woburn (TDD #F1-8109-02) will contain a geologic map of the study area. This map will be available in March 1982.

SECTION 3 - SAMPLING AND ANALYTICAL DATA

3.1 PRIORITY POLLUTANT SAMPLING AND ANALYSES (11/12/80 - 3/02/81)

E & E sampled 32 accessible wells in East and North Woburn (TDD #F1-8010-04A) between 12 November 1980 and 2 March 1981. These samples were subsequently analyzed for priority pollutants, and the sampling and analytical techniques and results are reported in Reference 9. Of the 32 wells sampled, ten are located within the East Central Woburn study area. Table 3-1 summarizes the analytical data for these ten wells. The compounds present in concentrations greater than ten parts per billion are 1,1,1-trichloroethane,

1,2-trans-dichloroethylene, tetrachloroethylene and trichloroethylene. Chloroform and trichlorotrifluoroethane mentioned in Section 1 were not detected. Trichlorotrifluoroethane is not a priority polutant and may have been present but not analyzed for by the laboratory.

3.2 SAMPLING AND VOLATILE ORGANIC ANALYSES (11/4/81 - 11/5/81)

As part of the monitoring well installation program in East and North Woburn (TDD #F1-8010-03A), seven monitoring wells (W-4, 5, 6, 7, 8, 21 and 22) were installed by E & E within the East Central Woburn study area. An additional well, E-41, was installed by Haley and Aldrich of Cambridge, Massachusetts for the Metropolitan District Commission (MDC). These eight wells plus six other accessible wells within the study area were sampled by E & E on 3 November 1981 using approved EPA methods. The samples were analyzed on 4 and 5 November 1981 at the EPA New England Regional Laboratory (NERL) in Lexington, Massachusetts. The results of these analyses are summarized in Table 3-2, and the analytical conditions are given in Appendix B.

1,1,1-Trichloroethane, 1,2-trans-dichloroethylene, trichloroethylene and tetrachloroethylene are again the primary chlorinated solvents present. A significant concentration (170 ppb) of a compound tentatively identified as acetone was detected in one well (W-5).

TABLE 3-1 Results of Analysis - Volatile Organics (ppb) (9) 11/12/80 - 3/02/81

			Well Number									
	6	364	419"G"	420"H"	436	439	E8	E27	E11	EllA		
1,1,1-trichloroethane	133	ND	ND	<10	ND	28	ND	ND	<10	<10		
1,2-trans-dichloroethylene	116	ND	14	21	<10	12	ND	<10	210	120		
tetrachloroethylene	28	ND	36	41	12	ND	ND	ND	89	63		
trichloroethylene	1372	ND	210	73	12	53	<10	19	280	160		
Benzene	ND	ND	<10	<10	<10	ND	<10	<10	<10	<10		
Chlorobenzene	ND	ND	ND	ND	ND	<10	ND	ND	ND	ND		

TABLE 3-2

Results of Analysis - Volatile Organics (ppb)

November 4, 5, 1981

	Well Number													
	E41	W436A	E27	E11	EllA	W6	E8	W436	W4	W5	W22	W21	W8	<u> W7</u>
1,2-trans-dichloroethylene	ND	8	ND	160	110	10	ND	4	ND	ND	52	420	10	ND
trichloroethylene	ND	19	ND	240	160	5	ND	18	ND	<1	170	520	55	ND
tetrachloroethylene	ND	17	ND	140	85	240	ND	20	ND	2	4	98	20	ND
toluene	ND	ND	ND	ND	ND	20	ND	ND	ND	5	ND	ND	ND	ND
chloroform	ND	ND	ND	ND	ND	ND	1	ND	ND	1	ND	ND	ND	ND
1,1,1-trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	110	ND	ND	ND	ND
methylene chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	13	ND	ND	ND	ND
l,l-dichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	ND	ND	ND	ND
acetone	ND	ND	ND	ND	ND	ND	ND	ND	· ND	170	ND	ND	ND	ND
methyl isopropyl ketone	ND	ND	ND	ND	ND	ND	ND	ND	ND	. 15	ND	ND	ND	ND

^{*} See Appendix B for analytical conditions for these data

SECTION 4 - EVALUATION OF ANALYTICAL DATA

Figures 4-1 through 4-4 are plots of the known areal extent of contamination for the four primary chlorinated solvents detected in the groundwater within the East Central Woburn study area. Data from both sampling efforts (See Sections 3.1 and 3.2) were used in constructing these maps. Analyses of 4 and 5 November 1981, preempted earlier analyses of the same wells. Data for wells sampled during both efforts were consistent.

Based upon the groundwater flow directions (Figure 2-4) and the areal extent of contamination plots (Figures 4-1 through 4-4), E & E concluded that the primary sources of the chlorinated solvents present in wells "G" and "H" lie to the north and northeast of these wells.

The plots for trichloroethylene and 1,2-trans-dichloroethylene (Figures 4-2 and 4-4) are similar. The plumes are distinctly oriented in a NE-SW direction and each plume has two areas of high solvents concentration (>300 ppb); one at well W-22, approximately 1200 feet northeast of wells "G" and "H" and one at well 6, which is located an equal distance southwest of these wells. The high concentrations at well 6 are likely because this well has the highest pumping rate within the study area (approximately 500,000 gpd). The high solvents concentrations at well W-21 indicate a contaminant source area to the northeast of that well. Chemical screening of split spoon samples collected every five feet during drilling detected no contamination in the overburden. It is likely that the solvents are migrating within the bedrock, possibly along a fault which intersects wells W-21 and W-22 and which trends northeast-southwest.

The areal plot for 1,1,1-trichloroethane is also distinctly linear, trending N-S and having two areas of high contaminant concentration (100-200 ppb). Well 6 is again an area of high concentration for the reason mentioned earlier. Well W-5 also contains a high concentration of 1,1,1-trichloroethane indicating a contaminant source north of that well. Again, no solvents were detected in the overburden during drilling indicating that contamination is migrating within the bedrock, possibly along a fault trending N-S.

Control Brown on Table 5 to 16 Miles for the William Control

in Address grage a

- A. AVA Warehouse
- B. Bachman Distributing Co.-Food distribution
- C. Allied Van Lines
- D. Woburn Mall Commercial
- E. Arlwood, Inc. Wood/Metal doors, hardware
- F. Brodie, Inc. Industrial trucks, tractors
- G. Brodie, inc. Industrial trucks, tractors
- H. Post Office
- I. Bradlee's Commercial
- J. Celotex Corporation Warehouse
- K. Economics Lab, Inc. Distributor of soap and cleaning compounds
- L. ADAP/Kamco. Commercial, auto parts
- M. Waterbed Warehouse Commercial
- N. Charrette Commercial, art supplies
- O. Woburn Foreign Motors
- P. Hogan Tire Company Tire distributor
- Q. Bliss marine Boating equipment
- R. Hurlbert Datsun Automobile sales and repair
- s. Cummings Industrial Centers Offices
- T. Northern Research and Engineering Corporation
- U. Continental Metal Products Hospital equipment
- V. Cummings Industrial Centers Offices
- W. Cummings Industrial Centers Offices
- X. Interstate Industrial Uniform Rental
- Y. Metro Siding and Roofing
- Z. W. R. Grace Food wrapping equipment
- AA. Hemingway Transportation, Inc. General commodities trucking
- BB. Cummings Industrial Centers Offices
- CC. Cummings Industrial Centers Offices
- DD. Cummings Industrial Centers Offices
- EE. Cummings Industrial Centers Offices
- FF. McKesson and Robbins Drug Company
- GG. 99 Restaurant
- HH. Koala Inn
- II. New England Plastics Plastics manufacturing
- JJ. Mirra Construction Company, Inc.
- KK. Independent Tallow Company

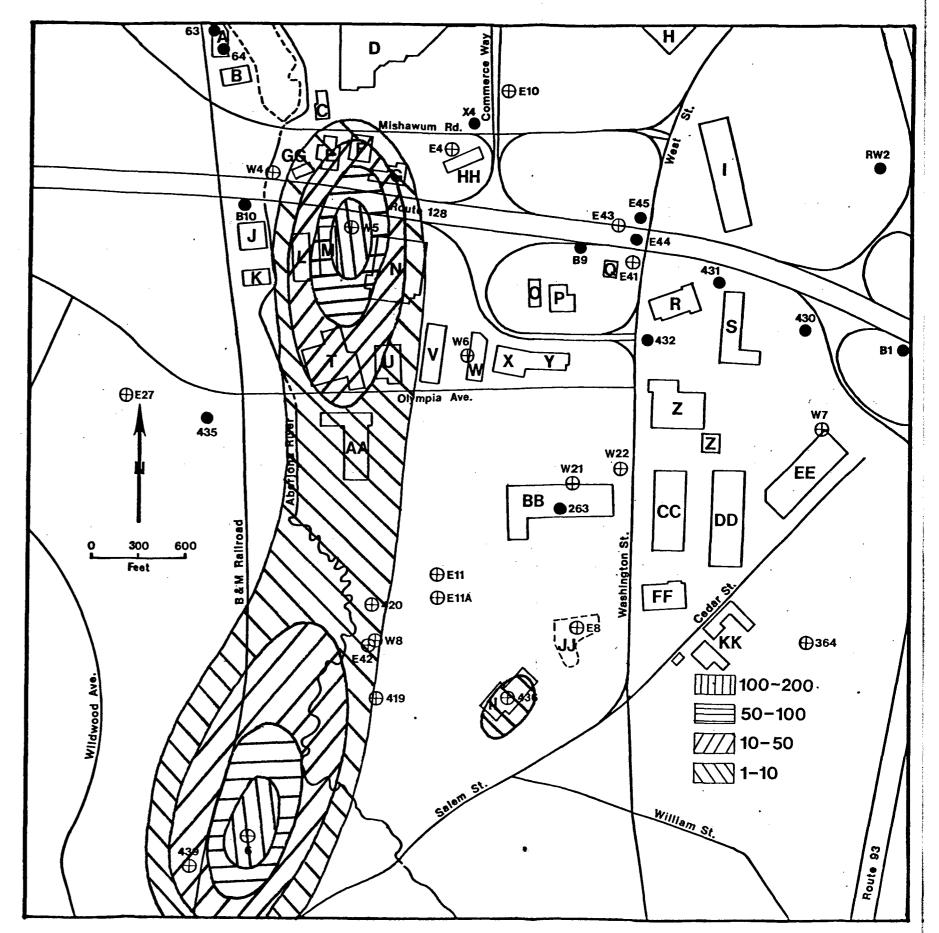


FIGURE 4-1: AREAL DISTRIBUTION OF 1,1,1-TRICHLOROETHANE [ppb]

- A. AVA Warehouse
- B. Bachman Distributing Co.-Food distribution
- C. Allied Van Lines
- D. Woburn Mall Commercial
- E. Arlwood, Inc. Wood/Metal doors, hardware
- F. Brodie, Inc. Industrial trucks, tractors
- G. Brodie, inc. Industrial trucks, tractors
- H. Post Office
- I. Bradlee's Commercial
- J. Celotex Corporation Warehouse
- K. Economics Lab, Inc. Distributor of soap and cleaning compounds
- L. ADAP/Kamco. Commercial, auto parts
- M. Waterbed Warehouse Commercial
- N. Charrette Commercial, art supplies
- O. Woburn Foreign Motors
- P. Hogan Tire Company Tire distributor
- Q. Bliss marine Boating equipment
- R. Hurlbert Datsun Automobile sales and repair
- s. Cummings Industrial Centers Offices
- T. Northern Research and Engineering Corporation
- U. Continental Metal Products Hospital equipment
- V. Cummings Industrial Centers Offices
- W. Cummings Industrial Centers Offices
- X. Interstate Industrial Uniform Rental
- Y. Metro Siding and Roofing
- Z. W. R. Grace Food wrapping equipment
- AA. Hemingway Transportation, Inc. General commodities trucking
- BB. Cummings Industrial Centers Offices
- CC. Cummings Industrial Centers Offices
- DD. Cummings Industrial Centers Offices
- EE. Cummings Industrial Centers Offices
- FF. McKesson and Robbins Drug Company
- GG. 99 Restaurant
- HH. Koala Inn
- II. New England Plastics Plastics manufacturing
- JJ. Mirra Construction Company, Inc.
- KK. Independent Tallow Company

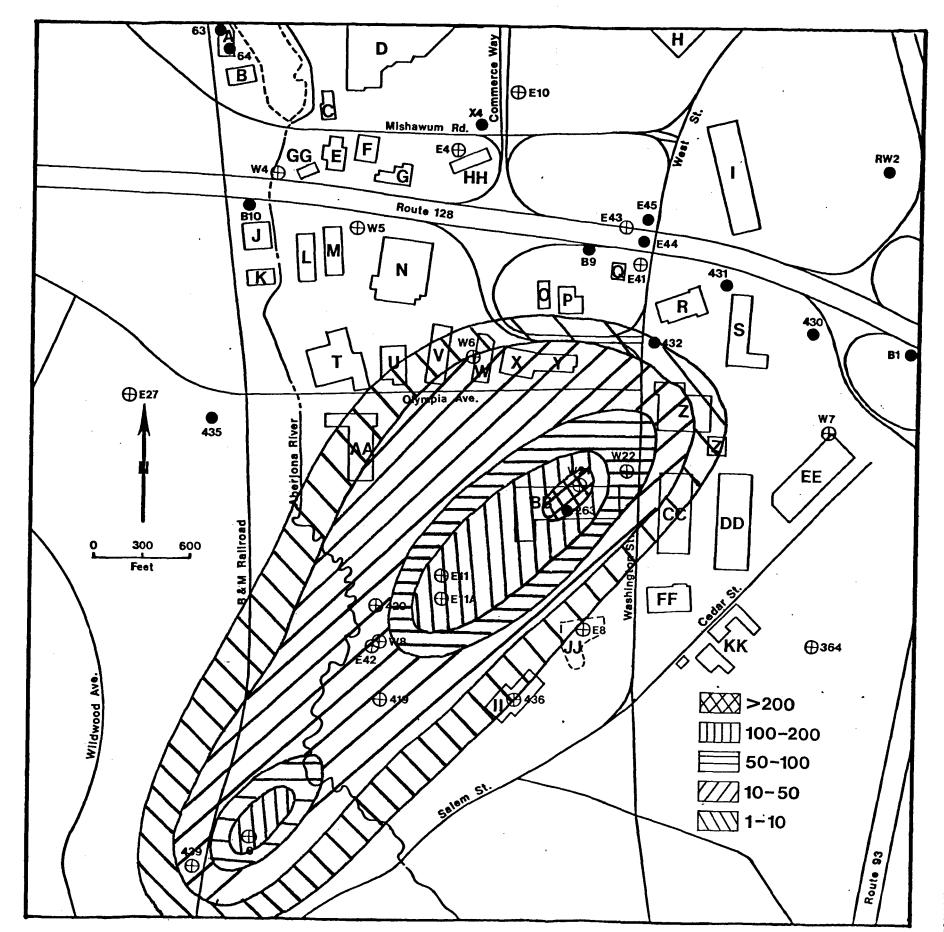


FIGURE 4-2: AREAL DISTRIBUTION OF 1,2-TRANS-DICHLOROETHYLENE (ppb)

- A. AVA Warehouse
- B. Bachman Distributing Co.-Food distribution
- C. Allied Van Lines
- D. Woburn Mall Commercial
- E. Arlwood, Inc. Wood/Metal doors, hardware
- F. Brodie, Inc. Industrial trucks, tractors
- G. Brodie, inc. Industrial trucks, tractors
- H. Post Office
- I. Bradlee's Commercial
- J. Celotex Corporation Warehouse
- K. Economics Lab, Inc. Distributor of soap and cleaning compounds
- L. ADAP/Kamco. Commercial, auto parts
- M. Waterbed Warehouse Commercial
- N. Charrette Commercial, art supplies
- O. Woburn Foreign Motors
- P. Hogan Tire Company Tire distributor
- Q. Bliss marine Boating equipment
- R. Hurlbert Datsun Automobile sales and repair
- s. Cummings Industrial Centers Offices
- T. Northern Research and Engineering Corporation
- U. Continental Metal Products Hospital equipment
- V. Cummings Industrial Centers Offices
- W. Cummings Industrial Centers Offices
- X. Interstate Industrial Uniform Rental
- Y. Metro Siding and Roofing
- Z. W. R. Grace Food wrapping equipment
- AA. Hemingway Transportation, Inc. General commodities trucking
- BB. Cummings Industrial Centers Offices
- CC. Cummings Industrial Centers Offices
- DD. Cummings Industrial Centers Offices
- EE. Cummings Industrial Centers Offices
- FF. McKesson and Robbins Drug Company
- GG. 99 Restaurant
- HH. Koala Inn
- II. New England Plastics Plastics manufacturing
- JJ. Mirra Construction Company, Inc.
- KK. Independent Tallow Company

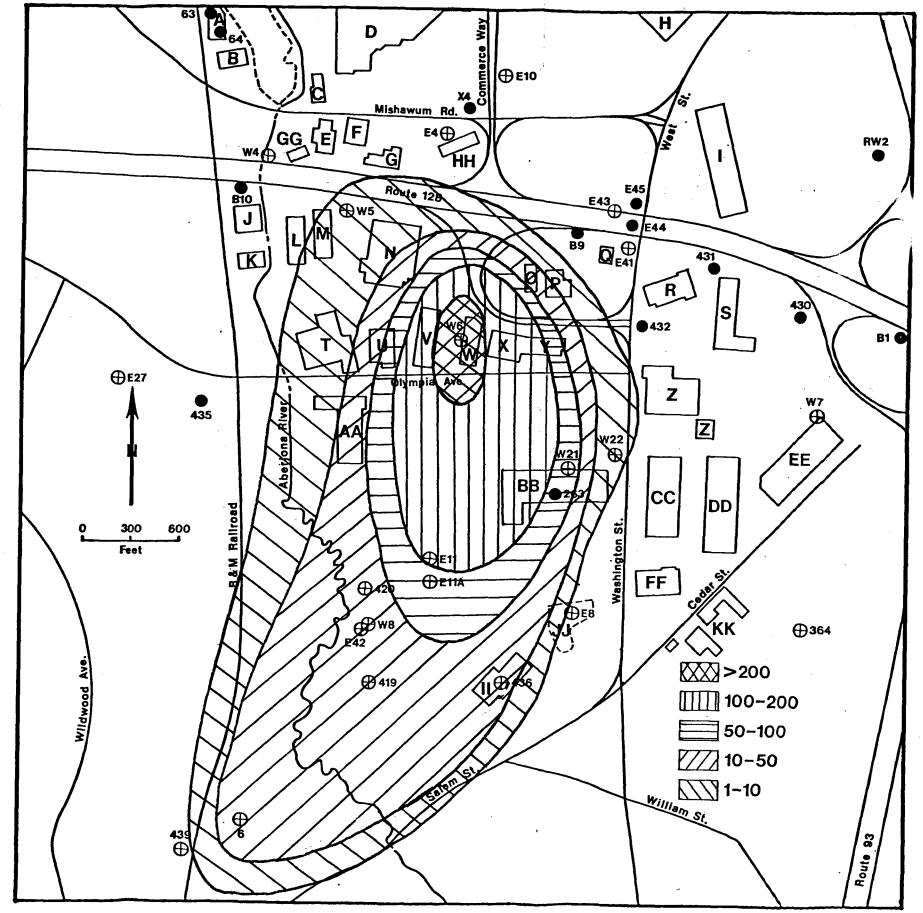


FIGURE 4-3: AREAL DISTRIBUTION OF TETRACHLOROETHYLENE [ppb]

- A. AVA Warehouse
- B. Bachman Distributing Co.-Food distribution
- C. Allied Van Lines
- D. Woburn Mall Commercial
- E. Arlwood, Inc. Wood/Metal doors, hardware
- F. Brodie, Inc. Industrial trucks, tractors
- G. Brodie, inc. Industrial trucks, tractors
- H. Post Office
- I. Bradlee's Commercial
- J. Celotex Corporation Warehouse
- K. Economics Lab, Inc. Distributor of soap and cleaning compounds
- L. ADAP/Kamco. Commercial, auto parts
- M. Waterbed Warehouse Commercial
- N. Charrette Commercial, art supplies
- O. Woburn Foreign Motors
- P. Hogan Tire Company Tire distributor
- Q. Bliss marine Boating equipment
- R. Hurlbert Datsun Automobile sales and repair
- s. Cummings Industrial Centers Offices
- T. Northern Research and Engineering Corporation
- U. Continental Metal Products Hospital equipment
- V. Cummings Industrial Centers Offices
- W. Cummings Industrial Centers Offices
- X. Interstate Industrial Uniform Rental
- Y. Metro Siding and Roofing
- Z. W. R. Grace Food wrapping equipment
- AA. Hemingway Transportation, Inc. General commodities trucking
- BB. Cummings Industrial Centers Offices
- CC. Cummings Industrial Centers Offices
- DD. Cummings Industrial Centers Offices
- EE. Cummings Industrial Centers Offices
- FF. McKesson and Robbins Drug Company
- GG. 99 Restaurant
- HH. Koala Inn
- II. New England Plastics Plastics manufacturing
- JJ. Mirra Construction Company, Inc.
- KK. Independent Tallow Company

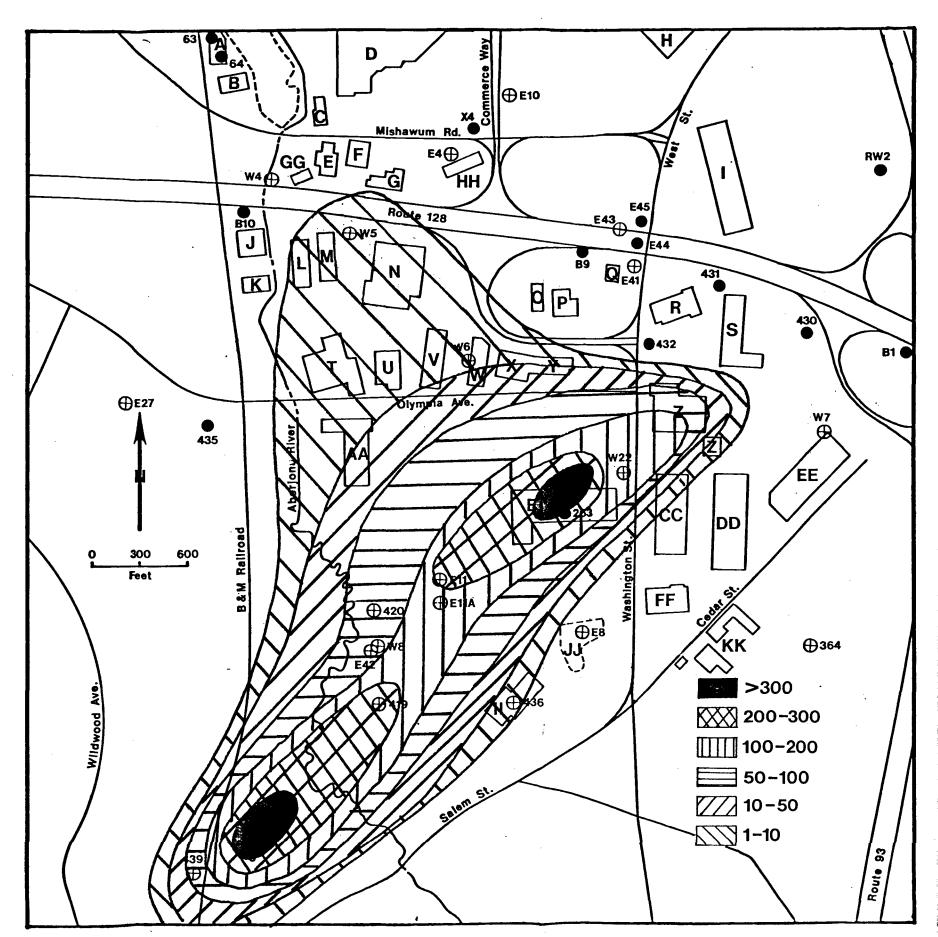


FIGURE 4-4: AREAL DISTRIBUTION OF TRICHLOROETHYLENE[ppb]

Section 4 - continued

Figure 4-3, the areal plot of tetrachloroethylene, is characterized by a high concentration (>200 ppb) at well W-6 and decreasing concentrations southward to well 6. This plume configuration indicates a contaminant source north of well W-6. As a high concentration has not yet reached well 6, it is likely that the tetrachloroethylene contamination is of more recent origin than the other solvents.

SECTION 5 - RECOMMENDATIONS FOR FURTHER STUDY

To further define the source or sources of solvents present in the groundwater within the East Central Woburn study area, the following studies are recommended:

- A. An inventory of all solvents used currently or in the past by industries located upgradient of the plumes defined in Section 4 should be performed. Storage and disposed practices of these industries should be carefully evaluated.
- B. Once specific industries have been identified as potential sources, groundwater quality monitoring wells should be appropriately sited and installed using hydrogeologic data for the area generated by previous E & E studies.

SECTION 6 - REFERENCES

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- 3. Priority Pollutant Samples collected by Massachusetts DEQE 24
 September 1979, analyzed by Lawrence Experiment Station on 25 and 26
 September 1979.
- 4. Priority Pollutant Samples collected by E & E 23 January 1981 to 30 January 1981, analyzed by Acurex on 26 February 1981.
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- 6. Cook, D. K. Site Inspection Report for Olin Chemicals Group Wilmington Plant. EPA FIT Project. TDD #F-8005-01F. 48 pp. 5 December 1980.
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 Conservation Commission. May 1980.
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- 12. Delaney, F. D., and Gay, F. B. Hydrology and Water Resources of the Coastal Drainage Basins of Northeastern Massachusetts, from Castle Neck River, Ipswich to Mystic River, Boston. U.S. Geological Survey Hydrologic Investigations Atlas No. 589 (1980).

ar y thirt parts.

:

APPENDIX A

Well Logs for Newly Installed EPA and MDC Wells

in

East Central Woburn, Massachusetts

Well Log # 120/1
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description	Uall No. IV O	
beptil, Ft. (h)		Well No. W-8	
	Blow Counts/6"	Location Woburn, MA	
		Owner U.S. EPA	
או ול		Ground Elev.45' MSL	
11		Driller Geo-Metrics, I	
	•	Drilling Completed 7/2	
11 11		Type of Rig Truck Moun	ted
	,	WELL DATA -	
		Well Diam. 1.4" ID	
	Fill 1-2-3-4	Depth 128.5'	
		Screen Diam. 1.4" JD	
		Screen Setting 4'-128.5	•
		Screen Type Schedule 80	
5	F-M Br Sand 8-12-14-16	0.01" Slot	
		Well Type Monitoring	· · · · · · · · · · · · · · · · · · ·
			vet -
	•	Static Water Level 2' 1	MOL
		Date Measured 10/30/81	
	•	WATER QUALITY	
	F Orange sand, trace of silt 4-6-5-3	Samples Taken Yes X	No
10	r orange sand, trace or sire 4-0-3-3	No. of Samples	
		Type of Samples Priority	у
		Pollutants	
		Date Sampled 11/30/81	
	Orange F sand silt, with thin layers	Samplers Porter and Fu	ucarile
15	of clay 2-6-7-8	Will be Analyzed for	
	• •		
			
20	F-M Br sand 1-2-3-3		
	r-ri bi saild 1-2-3-3	C1-1 C 77-1 +11-	
		Sampled for Volatile.	
		Organics 11/3/81	
	•		
	•		
25	no recovery 6-5-5-5		
		REMARKS	
30 0 0	M-C sand with some cobbles 4-3-5-7		
			, .
ドジロのジ		SOIL DESCRIPTION ABBRE	VIATIONS
			Br-brown
	•		Bl-black
いるジェランジ			Y-yellow
	C sand and gravel trace of silt		T-tan
35 0 0 0	12-13-8-8		
1: I Macyclad be	Det :	ecology and environment, inc.	Gr-grey
			R-red

Well Log # 120/2

ECOLOGY AND ENVIRONMENT, INC.

30 East Cummings Park
Woburn, MA 01801

Well Log # 120/2

Project Name Woburn Well Survey

Project # TDD F1-8010-03A

Date Prepared

Prepared By M. Hanley

Depth, Ft. (M)	Soil Description	Uall Na	77 0	
Depen, 200 (m)	Blow Counts/6"	Well No Location	w-o	•
	Diow country o	Location		
		Owner U.	C FDA	
10-1-10		Ground Elev.		
$ \rho \Box z $		Driller Geo		Inc
				Inc.
10:1-1:01		Drilling Com		ntod
		Type of Rig	LIFIT DATA	
40	C sand and gravel trace of silt			
	13-10-12-15	Well Diam. 1	.4 10	
O: 口 ~	13-10-12-13	Depth Screen Diam.	1 / U TD	
$\begin{bmatrix} 0 & \square \\ 0 & \square \end{bmatrix}$		Screen Setti		O DUC
		Screen Type		O PVC
1:0H2	C sand and gravel some sand		.01" Slot	
45 0 0	14-11-11	Well Type M		
	14-11-11-11	Static Water		
\~0\H-0\		Date Measure		
$ \mathcal{V}- $	•	WAT		
$1:0$ \square 0	•	Samples Take	n Yes	No
0:	Pro Cond and amount come atte	No. of Sampl		
50 0	Br. C sand and gravel some silt 24-26-76-50	Type of Samp	les	
	24-20-70-30			
10: 1701	•			
		Date Sampled		
0: -	•	Sampler s		
		Will be Anal	yzed for	
55	Gr. gravel, some sand and silt		-	
$ 0 \cdot - \cdot \mathcal{O} $	17-21-26-36			
	•			
				
-0.				
			······································	
60 0- 0-	C Gr sand with trace of silt (few			
	thin layers) grading to fine silt	· · · · · · · · · · · · · · · · · · ·	, <u>, , , , , , , , , , , , , , , , , , </u>	
· · · · · · · ·	and clay 29-30-36-30			
1.0.7				
0.0	·			
				
65				
	Gr silt, sand and gravel, trace of	DFM	ARKS	
	clay 34-50-66-78		AIGO	
10. 日心	•			
1-0:-				
.o∵□.o∴				
70	T sand and gravel, some silt, trace			
70 <u>0</u>	of clay 141-187	COTI DECODE	DTTON ADDO	かいて トカイヘンパク
0 10		SOIL DESCRI		
		Trace 0-10%		Br-brown
つご口がし		Some 10-40%		Bl-black
		And 40-50%	F-Fine	Y-yellow
16、日公	No Recovery wash-med-fine sand 8-25-	47 - 80 ·		T-tan
75-1	iper		•	Gr-grey
*** 1 2 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	No.	ecology and em	vironment, inc.	R-red

Well Log # 120/3
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"	Well No. W-8	
80 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Br-T sand and gravel, trace of clay 25-40-40-40	Owner U.S. EPA Ground Elev. Driller Geo-Metrics, I Drilling Completed Type of Rig Truck Mour	nted
85 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Br-T C-sand and gravel trace of silt and clay 10-16-25-25	Screen Setting Screen Type Schedule 80 0.01" Slot Well Type Monitoring Static Water Level Date Measured WATER QUALITY Samples Taken Yes	
90 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Br. C-sand and gravel trace of silt 14-15-16-21 no sample recovery 17-28-26-25	No. of Samples Type of Samples Date Sampled Samplers Will be Analyzed for	
100	T C sand and gravel some silt, trace of clay 20-47-58-60		
105 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Gr. C. sand and gravel some silt, trace of clay 77=207 for 6"	REMARKS	
110 0 0 0	Gr. C. sand and gravel grading to fine sand 24-30-33-27		EVIATIONS Br-brown Bl-black
115 0 0 0 0 recycled pa	GrT C sand and gravel some silt, trace of clay 20-23-26-20	And 40-50% F-Fine	Y-yellow T-tan Gr-grey R-red

Well Log # 120/4
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

	•	
Depth, Ft. (M)	Soil Description	Well No. W-8
	Blow Counts/6"	Location
0		Owner U.S. EPA
		Ground Elev.
		Driller Geo-Metrics, Inc.
	•	
		Drilling Completed
	Gr. C. sand and gravel with trace	Type of Rig Truck Mounted
120 - 0	of silt and clay 43-103-105-89	
10:二口:0:1	of Sile and Clay 10 100 100	Well Diam. 1.4" ID
i a ⊟÷o	•	Depth
0		Screen Diam. 1.4" ID
		Screen Setting
x x x x		Screen Type Schedule 80 PVC
	Bedrock	0.01" Slot
125 X X X X X		Well Type Monitoring
I.X.⊟.X√I		Static Water Level
× _× × × _× ×		Date Measured
$ x^{\times} + x^{\times} $	•	
		WATER QUALITY
1 1 1	·	Samples Taken Yes No
130-		No. of Samples
		Type of Samples
		·
		Date Sampled
		Samplers
105		Will be Analyzed for
135		* ************************************
	•	
140		
.]] [
145		
'	• •	
	•	REMARK S
	•	
	•	
	•	
150-		
		SOIL DESCRIPTION ABBREVIATIONS
	·	
	•	Trace 0-10% C-Coarse Br-brown
	•	Some 10-40% M-Medium Bl-black
		And 40-50% F-Fine Y-yellow
155-		T-tan
1 1 1		Gr-grey
recycled s	Naper	ecology and environment, inc. R-red

Well Log # 121
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley

Donth Et (M)	Soil Description	Well No. W-7	
Depth, Ft. (M)	Soil Description Blow Counts/6"		
	blow counts/o	Location Woburn, MA	
		Owner U.S. EPA	
		Ground Elev. 91' MSL	
7115		Driller Geo-Metrics, I	
		Drilling Completed 6/24/	
		Type of Rig Truck Moun	
		WELL DATA -	
		Well Diam. 1.4" ID	٠
	Fill 1-7-11-9	Depth 28'	
$\mathbb{N} \setminus \{X\}$		Screen Diam. 1.4" ID	
$V \times V \times$		Screen Setting 4'-28'	
		Screen Type Schedule 80	PVC
5 \ X \ \ \ \	Fill 2-6-8-5	0.01" Slot	
		Well Type Monitoring	
		Static Water Level 4'1'.	·
		Date Measured 10/30/81	
		WATER OHALITY	
	Gr. fine-med sand overlying R-Y clays	Samples Taken Yes X	No
10	silts and sand with angular gravel	No. of Samples	
0-00	pieces	Type of Samples Priorit	:y
7: □0-		Pollutant	
	Till 11-20-23-24		
		Date Sampled	
	V 0 P 1	Samplers	
15	M-C Br. sand trace silt over	Will be Analyzed for	
	BrG. silt sand and cobbles		
0-0-0	Till 70-48-54-100		
	1111 /0-48-54-100		
*			
x x □ x . x			
$20 \times \times$		Sampled for Volatile	
× 🗆 ×		Organics 11/3/81 .	
x x x x			
x x	Bedrock		
$ \mathbf{x} \mathbf{x} \mathbf{y} \mathbf{y} \mathbf{x} \mathbf{x} \mathbf{x} $			
25			
X X T T T T T T T T			
x x 目x x		REMARKS	
, x ,			
X X X X			
30			
		SOIL DESCRIPTION ABBRE	VIATIONS
			Br-brown
	•		Bl-black
	•		Y-yellow
35-			T-t an
recycled ba	aper		Gr-grey
			R-red

Well Log # 122
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M)		Well No.	W21	
	Blow Counts/6"	Location	Woburn, M	<u>IA</u>
		Owner U.	S. EPA	
٦, ,,		Ground Elev.		
		Driller Geo		Tnc
		Drilling Com		
		Type of Rig		
rooth Hoos		Type of Rig_	LIETT DATA	inced
o. .o.		Well Diam. 1		
$ \cdot o \cdot o $	T411 0 / 0 10		1.5'	
	Fill 2-4-8-19	*		
		Screen Diam.		
0 0		Screen Setti		
·0: 🗀 · ·0·.		Screen Type		O PVC
1. O. H	Fill 34-30-50-50		.01" Slot	
i.º□:o·l		Well Type M		
· O: 🖂 : o :		Static Water		
0		Date Measure		
	·	WAT		
· · · · · · · · · · · · · · · · · · ·	7217 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Samples Take		No
·: 0: 🖂 · .0:	Fill, sand and gravel 17-25-35-50	No. of Sampl		
.0.□.0.:		Type of Samp	les Prio	rity
· 0 - 0		Pollutant		
· o. 日 o				
		Date Sampled		
: O: H: O:		Samplers		
· ○ . ⊟ · o	Fill, sand and gravel 42-55-23-30	Will be Anal	yzed for	
.0. 🗀 🗸 : 1				
· o				
:0. H				
· · · ⊢ · · · · · · · · · · · · · · · ·				
30 30	P-V class of t and cond 20 20 100/Ell			
0	R-Y clay, silt and sand 28-20-100/5"			
-0-1-4	TN 57. 9			
$\times \times \square \times \times$	R ₅ Y clay, silt and sand w/ some gravel 10-15-50/1"	Sampled for	- 77-1-41-	
×□×□	10-13-30/1	Organics 1		
$\times \times \sqcup \times \times $				
××× ××				
· —				· · · · · · · · · · · · · · · · · · ·
$x^{\times} \times \square x^{\times} \times \square$				
n (1 1 1 1	Padas t	REM	ARKS	
××日××	Bedrock	N.S.F.I	431/1/0	
××目xxl				
※目気し				
スロン				
× ^x × × ×		COTT DECCET	ממפג ארדתם	 PUTATTAN
		SOIL DESCRI		
	,	Trace 0-10%	C-Coarse	Br-brow
		Some 10-40%		Bl-blac
	•	And 40-50%	F-Fine	Y-yello
				T-tan
beyeled bar	per .	ecology and envi	ANDINITA - ILA	Gr-grey

Well Log # 123/1
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M	Soil Description Blow Counts/6"	Well No. W-4 . Location Woburn, MA
	•	
		Owner U.S. EPA
4, ,,		Ground Elev. 53.5' MSL
	•	Driller Geo-Metrics, Inc.
		Drilling Completed 7/1/81
		Type of Rig Truck Mounted
		WELL DATA
	top soil	Well Diam. 1.4" ID Depth 91'
Ta.		Screen Diam. 1.4" ID
5/2		Screen Setting 4-91'
		Screen Type Schedule 80 PVC
'	top soil	0.01" Slot
200		Well Type Monitoring
10 / 10 / 1		Static Water Level 5' MSL
		Date Measured 10/30/81
1000	•	WATER QUALITY
	V 0 D W 17. 1 1 1	0 - 1 m.1 v v
MOHON!	M-C BrY silt and sand, some cobbles.	No. of Samples
	20-10-10-8	Type of Samples Priority
	•	Pollutant
	•	FOITHCANC
	•	Date Sampled 11/30/81
	F-M T sand 5-4-7-6	Samplers Cook, Porter
1::::口::::1		Will be Analyzed for
	•	
	F-M T sand 4-3-5-5	Sampled for Priority Pollutar
	i ii i sana 4 5 5-5	Organics 11/3/81
	Gr, F sand, silt $4-4-3-3$	
		REMARK S
- : - :		
	Om 64 1 1 1 1 0 0	
	Gr. fine sand, silt $W/R-1-2-2$	
	•	. •
		SOIL DESCRIPTION ABBREVIATION
1		Trace 0-10% C-Coarse Br-brow
1 4 1	•	Some 10-40% M-Medium Bl-blad
		DOME TO JOB W. WESTIME DISCORD
	Or fine sand and silt 4-2-2-2	And 40-50% F-Fine Y-yello
	Gr. fine sand and silt 4-2-2-2	

Well Log # 123/2
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

Gr. fine sand and silt 4-10-10-10 Gr. fine sand and silt, trace of W/R-2-5-7 Gr. fine sand and silt, trace of 3-6-4-4	Well Diam. 1.4" ID Depth Screen Diam. 1.4" ID Screen Setting Screen Type Schedule 80 PVC O.01" Slot ClayWell Type Monitoring Static Water Level Date Measured
Gr. fine sand and silt, trace of W/R-2-5-7	Ground Elev. Driller Geo-Metrics, Inc. Drilling Completed Type of Rig Truck Mounted
Gr. fine sand and silt, trace of W/R-2-5-7	Driller Geo-Metrics, Inc. Drilling Completed Type of Rig Truck Mounted
Gr. fine sand and silt, trace of W/R-2-5-7	Drilling Completed Type of Rig Truck Mounted Well Diam. 1.4" ID Depth Screen Diam. 1.4" ID Screen Setting Screen Type Schedule 80 PVC O.01" Slot clayWell Type Monitoring Static Water Level Date Measured
Gr. fine sand and silt, trace of W/R-2-5-7	Type of Rig Truck Mounted Well Diam. 1.4" ID Depth Screen Diam. 1.4" ID Screen Setting Screen Type Schedule 80 PVC O.01" Slot ClayWell Type Monitoring Static Water Level Date Measured WATER QUALITY Samples Taken Yes No
Gr. fine sand and silt, trace of W/R-2-5-7	Well Diam. 1.4" ID Depth Screen Diam. 1.4" ID Screen Setting Screen Type Schedule 80 PVC O.01" Slot ClayWell Type Monitoring Static Water Level Date Measured
Gr. fine sand and silt, trace of W/R-2-5-7	Well Diam. 1.4" ID Depth Screen Diam. 1.4" ID Screen Setting Screen Type Schedule 80 PVC O.01" Slot ClayWell Type Monitoring Static Water Level Date Measured
Gr. fine sand and silt, trace of W/R-2-5-7	Depth Screen Diam. 1.4" ID Screen Setting Screen Type Schedule 80 PVC O.01" Slot clayWell Type Monitoring Static Water Level Date Measured
	Depth Screen Diam. 1.4" ID Screen Setting Screen Type Schedule 80 PVC O.01" Slot clayWell Type Monitoring Static Water Level Date Measured
	Screen Setting Screen Type Schedule 80 PVC 0.01" Slot ClayWell Type Monitoring Static Water Level Date Measured
	Screen Setting Screen Type Schedule 80 PVC 0.01" Slot ClayWell Type Monitoring Static Water Level Date Measured
	Screen Type Schedule 80 PVC O.01" Slot clayWell Type Monitoring Static Water Level Date Measured WATER QUALITY Samples Taken Yes No
	O.01" Slot ClayWell Type Monitoring Static Water Level Date Measured WATER QUALITY Samples Taken Yes No
	ClayWell Type Monitoring Static Water Level Date Measured WATER QUALITY Samples Taken Yes No
	Static Water Level Date Measured WATER QUALITY Samples Taken Yes No
Gr. fine sand and silt, trace of of 3-6-4-4	Date Measured WATER QUALITY Samples Taken Yes No
Gr. fine sand and silt, trace of 3-6-4-4	WATER QUALITY Samples Taken Yes No
Gr. fine sand and silt, trace of of 3-6-4-4	Samples Taken Yes No
Gr. fine sand and silt, trace of 3-6-4-4	No. of Samples Clay Type of Samples
Gr. fine sand and silt, trace of 3-6-4-4	clayNo. of Samples Type of Samples
3-6-4-4	Type of Samples
	· · · · · · · · · · · · · · · · · · ·
	Date Sampled
	Sampler s
Gr. fine sand and silt, trace of	clayWill be Analyzed for .
6-5-4-4	
一点に日本に	
Gr. fine sand and silt, $5-6-12-10$	
- [프린디프]	
65 Gr. fine sand and silt 5-7-6-5	
· →: · ├──┤: <u>→ ·</u> · ·	
	REMARKS
70 G. fine sand and silt, trace of cl	lay
3-5-5-6	
	SOIL DESCRIPTION ABBREVIATIONS
	Trace 0-10% C-Coarse Br-brown
	Some 10-40% M-Medium Bl-black
	And 40-50% F-Fine Y-yellow
	T-tan
75 Gr. fine sand and silt $1/W/H-2-3$	Gr-grey
recycled paper	GICKICA

Well Log # 123/3
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

·					
Depth,	Ft	. (м)	Soil Description	Well No. W-4	
			Blow Counts/6"	Well No. W-4 Location	
				200 CUCTON	
1		12:	-7	Owner U.S. EPA	
, - -	`: 	: -: :		Ground Elev.	
	$\overline{\cdot}$				
 	÷}		· · · · · · · · · · · · · · · · · · ·	Driller Geo-Metrics, In	<u>c.</u>
	<u>:</u>]	Drilling Completed	
- 7	$: \vdash$	7.]	Type of Rig Truck Mount	ed
80	:├─		Gr. fine sand, silt, trace of gravel	WELL DATA	
-0-	二二		19-18-15-100/2 1/2"	well blam. 1.4" ID	
	?├—	Ω:		Depth	
	∷⊏			Screen Diam. 1.4" ID	
j.÷0:	-	σ	· · · · · · · · · · · · · · · · · · ·	Screen Setting	
x >	;;;;;;	XX	·	Screen Type Schedule 80	PVC
!	` -	i		0.01" Slot	
1 ^		Х	Bedrock	Well Type Monitoring	
XX	、二	XX	bedrock	Static Water Level	
×	-	Х		Date Measured	
××	$\downarrow \vdash$	l		WATER QUALITY -	
1	`	XX		•	
X		Х	·	Samples Taken Yes	No
9 0┤ ४♡		XX			
×				Type of Samples	
	1				
1	1				
1				Date Sampled	
				Samplers	
95-			·	Will be Analyzed for	
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	1 1			COTI DECOTIONION ADDESS.	ያ ል ጥፕ ለ እነጥ
				SOIL DESCRIPTION ABBREVE	
}	1 1				r-brown
}	1 1				l-black
1		· 			-yellow
	1	İ	·		-tan
1154	, ,			_	
115			paper	G	r-grey

R-red

		ECOLOGY AND ENVIRONMENT, INC. 30 East Cummings Park Woburn, MA 01801	Well Log # 124/1 Project Name Woburn Well Stroject # TDD F1-8010-01 Date Prepared 11/30/81 Prepared By M. Hanley	3A
	Depth, Ft. (M)	Soil Description Blow Counts/6"	Well No. W-6 Location Woburn, MA	·
			Owner U.S. EPA Ground Elev. 57.5' MSL Driller Geo-Metrics, Inc. Drilling Completed 7/14/8 Type of Rig Truck Mounted WELL DATA	31 i
		Fill .	Well Diam. 1.4" ID Depth 94' Screen Diam. 1.4" ID Screen Setting 4-94' Screen Type Schedule 80 PV	/C
5		T. sand and silt, some cobbles. (Till) 7-18-23-25	O.01" Slot Well Type Monitoring Static Water Level 8'2" Date Measured 10/30/81 WATER QUALITY	
10·		T. C. sand and silt, some cobbles (Till) 8-13-33-60	Samples Taken Yes x No. No. of Samples Type of Samples Priority P	
15 ⁻		T. sand and silt, and clay, some cobbles (Till) 27-40-93-50/2"	Date Sampled 11/30/81 Samplers Cook, Porter Will be Analyzed for	
20·		T-Gr. sand and silt, Trace of clay, cobbles (Till) 54-100/3"	Sampled For Volatile Organia/3/81	mics
25 [.]		T-Gr. clay, silt and sand (till) 100/4"		
30·		T.Gr. clay, silt and sand (till)	REMARKS	
o F		T., Gr, clay, silt and sand and gravel	Some 10-40% M-Medium Bl-And 40-50% F-Fine Y-y	ATIONS -brown -black yellow
35·	ecycled par	(Till) 100/4"	ecology and environment, inc.	-grey

Well Log # 124/2
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"	Well No. W-6 Location	•
		Owner U.S. EPA	
		Ground Elev.	
		Driller Geo-Metrics,	Inc.
	•	Drilling Completed	
	•	Type of Rig Truck Mou	nte d
		WELL DATA	
40	T. Gr. clay, silt and sand, gravel	Well Diam. 1.4" ID	
	(Till) 35-53-46-50	Depth	
		Screen Diam. 1.4" ID	
10-13-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-		Screen Setting	
		Screen Type Schedule 8	O PVC
	Tr. Gr. clay silt and sand, some	0.01" Slot	
45 - 0-	gravel and boulders (till) 100/6'	Well Type Monitoring	
	graver and bourders (cirr) 100/0	Static Water Level	
· - 0 - C - 1	•	Date Measured	
1-07 -07		WATER QUALITY	
n_{-}		Samples Taken Yes	
1 0 F T T	T around trace of alan area wilt	No. of Samples	
50-0-0-0-	T. gravel, trace of clay some silt (till) 100/4"	Type of Samples	
1×_5/1/51	(CIII) 100/4	1) po 01 0 amp 100	
-25	S .		···
-04 H2		Date Sampled	
- - - - - - - - -		Samplers	
10-0-1	Tr. T. clay, silt and sand, some	Will be Analyzed for	
55 00 0	gravel (Till) 52-100/5"		
	•		
	•		
	boulder, gravel		····
	, 5	,	
			
$\square \square \square \square$			
55 O	Gr. F-M sand and silt with cobbles		
	(Till) 7-37-52-71	REMARKS	
	<u> </u>		
70 - D D	Gr. f-m sand and silt with cobbles		
	13-57-100/4"	SOIL DESCRIPTION ABBR	EVIATIONS
	20 21 200/1	Trace 0-10% C-Coarse	Br-brown
	•	Some 10-40% M-Medium	B1-black
		And 40-50% F-Fine	Y-yellow
	$oldsymbol{\eta}$. The second		T-tan
	T. silt, trace of sand 2" lenses of	clay.	Gr-grey
recycles p	aper 25-50/100	ocology and environment; inc.	oj

Well Log # 124/3
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description	Well No. W-6
	Blow Counts/6"	Location
是四月五		Owner U.S. EPA
		Ground Elev.
	•	Driller Geo-Metrics, Inc.
		Drilling Completed
		Type of Rig Truck Mounted
	silt, sand and boulders (till)	WELL DATA
80	120/5"	Well Diam. 1.4" ID
Q - 1 - Q - 0		Depth
-00 -00	•	Screen Diam. 1.4" ID
5.5	•	Screen Setting
HO HO		Screen Type Schedule 80 PVC
XXIXX		0.01" Slot
85 X X	•	Well Type Monitoring
x`x x`x	•	Static Water Level
		Date Measured
x x x x		WATER QUALITY
X コX./	Bedrock	Samples Taken Yes No
X X X X	•	No. of Samples
90 x x = x x		Type of Samples
^x	•	Type of Samples
IX X L IX X I		
xx xx		Date Sampled
XXXX	. •	Samplers
_		Will be Analyzed for
95-		

00	·	
05	re .	
⁰³]		
		REMARKS
10-		
		·
		SOIL DESCRIPTION ABBREVIATIONS
		Trace 0-10% C-Coarse Br-brown
	• •	Some 10-40% M-Medium Bl-black
	•	And 40-50% F-Fine Y-yellow
		你_ 4
15-		T-tan Gr-grey

ECOLOGY AND ENVIRONMENT, INC. 30 East Cummings Park Woburn, MA 01801 Well Log # 125/1
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M) Soil Description	Well No.	W5	
	Blow Counts/6"		Woburn, MA	
	•			
			S. EPA	
או ול		Ground Elev	54' MST.	
		Driller Geo		
	•	Drilling Com		
		Type of Rig_	Truck Mou	ınte d
	Br M Sand 1-3-5-5	Well Diam. 1		
	Br ii balla r-5-5-5		55.5'	
		Screen Diam.		- •
		Screen Setti Screen Type		
5	Br Silt and F Sand 9-12-14-15		.01" Slot	OU PVC
		Well Type M		
	•	Static Water		11!!
		Date Measure		
		WAT		
		Samples Take	•	
10	Br Silt	No. of Sampl		
		Type of Samp		ltv
	•	Pollutant	*****	
		Date Sampled		
		Samplers Co		•
15		Will be Anal	yzed for_	
				
	Br F Sand 1-3-7-7			
	Dr r build r 5 7-7			·
		Sompled for	· \\.	
20		Sampled for		
201		Organics 1	1/3/81	
	Br F-M Sand 6-7-8-10			•
		·	·	
	Br F Sand grading to Br-Gr Silt			<u></u>
	with trace clay 10-12-15-17			
25	10 12 15 17			***************************************
		* 		
		REM	ARKS	
				· · · · · · · · · · · · · · · · · · ·
				
30				
	D 77 4 6 5 5 5 5 5			
	Br F-M Sand 3-8-9-11	SOIL DESCRI		
		Trace 0-10%		Br-brown
		Some 10-40%	M-Medium	Bl-black
	Thin beds of F Silts, Clay and	And 40-50%	F-Fine	Y-yellow
35	F Sand 6-7-9-10			T-tan
1. : : 1 BCACIOG.	- cana o , , , 10	ecology and envi	ronment, inc.	Gr-grey
				R-red

ECOLOGY AND ENVIRONMENT, INC. Project Name Woburn Well Survey 30 East Cummings Park Project # TDD F1-8010-03A Woburn, MA 01801 · Date Prepared Prepared By M. Hanley Depth, Ft. (M) W**-**5 Soil Description Well No. Blow Counts/6" Location Owner U.S. EPA Ground Elev. Driller Geo-Metrics, Inc. Drilling Completed Type of Rig Truck Mounted 40 Well Diam. 1.4" ID Depth Screen Diam. 1.4" ID Br F Silt and Clay 8-8-8-7 Screen Setting Screen Type Schedule 80 PVC 0.01" Slot 45 Well Type Monitoring Static Water Level Date Measured Bedded Br Silt, Trace Clay ----- WATER QUALITY -----4-7-7-20 Samples Taken Yes No. of Samples 50 Type of Samples Date Sampled Gravel, Some Silt, Trace Clay (TILL) 94-63-30-27 Samplers Will be Analyzed for Refusal at 54'7" 55-100/1 X X XX X XX X Bedrock XX XX 60 X X XX XX X X XX XX X X $\times \times$ ×Χ REMARKS 70 SOIL DESCRIPTION ABBREVIATIONS Trace 0-10% C-Coarse Br-brown

75-

Well Log #

Some 10-40%

And 40-50%

M-Medium

F-Fine

ecology and environment, inc.

Bl-black

Y-yellow T-tan

Gr-grey

R-red

125/2

Well Log # 126/2 ECOLOGY AND ENVIRONMENT, INC. Project Name Woburn Well Survey 30 East Cummings Park Project # TDD F1-8010-03A Woburn, MA 01801 Date Prepared Prepared By M. Hanley Depth, Ft. (M) Soil Description Well No. E41 Blow Counts/6" Location Owner U.S. EPA XX Ground Elev. Driller Geo-Metrics, Inc. X X XX X X Drilling Completed хX X X Type of Rig Truck Mounted X X ----- WELL DATA -----X X XX Well Diam. 1.4" ID 40-X × XX X X Depth X Screen Diam. 1.4" ID XX x x Bedrock Screen Setting X X XX Screen Type Schedule 80 PVC X X X 0.01" Slot X XX XX Well Type Monitoring 451 X X Static Water Level XX x X X Date Measured-X ХX XX ----- WATER QUALITY -----X X Samples Taken Yes No X X x x No. of Samples XX 50 x x Type of Samples X Date Sampled X Samplers XX Will be Analyzed for **55** 60 65 REMARKS 70-SOIL DESCRIPTION ABBREVIATIONS Br-brown Trace 0-10% C-Coarse Some 10-40% M-Medium B1-black And 40-50% F-Fine Y-yellow T-tan 75-Gr-grey tecycled paper

ecology and environment, inc.

R-red

Well Log # 126/1
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley

T-tan Gr-grey

R-red

a story spire of with pariety for

•			•	Prepared By M. Hanley
Dept	h, F	t. (M)	Soil Description Blow Counts/6"	Well No. E41 . Location Woburn, MA
C] -			Owner MDC Ground Elev. 122.4' MSL DrillerGuild Drilling Co., Inc. Drilling Completed 8/7/81
0.0 0.0) ;; ;; ;;	00 00 00	Br. F-M sand & gravel; Boulder, rock fragments	Type of Rig Truck Mounted WELL DATA Well Diam. 1.4" ID Depth 54' 1" Screen Diam. 1.4" ID
5 9) -)-	-0 0-0 0-0	GrBr., F-C sand & gravel;	Screen Setting 34'1"-44'1" Screen Type Schedule 80 PVC 0.01" Slot Well Type Monitoring
10		Ο - - - - - - - - - - - - - - - - - - -	some silt, trace boulders (Till)	Static Water Level 26'2" MSL Date Measured 10/30/81 WATER QUALITY Samples Taken Yes x No No. of Samples
	101:5:1:	-0 -0 -0		Type of Samples Priority Pollutants Date Sampled 11/30/81 Samplers Cook, Porter
15	デン・ ケー	-O- 0- 0- 0-		Will be Analyzed for
20				Sampled for Volatile Organics 11/3/81
25 x x	- 1	×× ××		•
X X X	x x	XX XX XX		REMARKS Well Log Courtesy of Haley & Aldrich, Inc. 238 Main Street
30 X X X X	x <	X x X x X x X		Cambridge, MA SOIL DESCRIPTION ABBREVIATIONS Trace 0-10% C-Coarse Br-brown
X X X X	×	×××	Bedrock	Some 10-40% M-Medium Bl-black And 40-50% F-Fine Y-yellow

Well Log # 127/1
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (1	M) Soil Description	Well No. W22
	Blow Counts/6"	LocationWoburn, MA
		Owner U.S. EPA
		Ground Elev. 84' MSL
	•	Driller Geo-Metrics, Inc.
	•	Drilling Completed 9/22/81
		Type of Rig Truck Mounted
] · ·	WELL DATA
 	Sand, topsoil 1-1-46	Well Diam. 1.4" ID
	bana, copsoil i i io	Depth 44' MSL
		Screen Diam. 1.4" ID
		Screen Setting 4'-44' MSL
	Sand 7-11-23-50/3"	Screen Type Schedule 80 PVC
5 X X X X X X X X X X X X X X X X X X X	Juna 7 11 23 30/3	0.01" Slot
TX TX		Well Type Monitoring
	Boulder Refusal	Static Water Level 26'
グ目ろ		Date Measured 10/15/81
	·	WATER QUALITY
して正く		Samples Taken Yes x No
101 H U	Boulder	No. of Samples
0: 0:		Type of Samples Priority
L , , · - · .		Pollutants
	Gr., C sand and gravel 80-84-110/4"	
0000		Date Sampled
		Samplers
15 0 0	·	Will be Analyzed for
6:目6:	•	
lo 目o	GB. C sand and gravel 47-60-92	
O 日 O		Sampled for Volatile Organics
。。○日。		11/3/81
2010日	••	
10. 目心		
$\Box \sigma \Box \sigma$		
10. 17		
~!:OH:	GB C sand and gravel 90-50-47-37	
25 0		
		DEMARKS
10: H.		REMARKS
	C B C	
$a \mapsto \Box a \mapsto$	GB. C sand and gravel 80-110/4"	
30		
		SOIL DESCRIPTION ABBREVIATIONS
차 디 차		Trace 0-10% C-Coarse Br-brown
:\times:	,	Some 10-40% M-Medium Bl-black
	GB. C sand and gravel, some silt	And 40-50% F-Fine Y-yellow
2. I → ¬ ¬ ¬	55-125/5"	T-tan
35 :- 0 :- 0	haner	Cracray
	5/41/6.4.1	ecology and environment, inc. R-red

Well Log # 127/2
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M) ·	Soil Descripti	ion.	Well No.	W22	
Depth, It. (II	<u> </u>	Blow Counts/6'		Location		• • •
		Diow Counts/0	*	Location		
·	,			Owner U.	S. EPA	
X X ⊟X X				Ground Elev.		
-1 X \square X		•		Driller Geo		Inc.
X,X X,X				Drilling Com		
xx 目xx				Type of Rig		nted
l'x ⊟'x`					WELL DATA	
40 X X X X	Bedrock			Well Diam. 1		
X = X				Depth		
XX X X				Screen Diam.	1.4" ID	
$ x^{\prime}x =x^{\prime}x$				Screen Setti		
XX XX				Screen Type		O PVC
1- 	†		•		.01" Slot	
45				Well Type M		
1 1 1	†			Static Water		
		•		Date Measure		
				WAT	ER QUALITY	
		·		Samples Take	•	
				No. of Sampl		
50-				Type of Samp	les	
						
	1					
				Date Sampled		
				Samplers		
	ļ	•	•	Will be Anal	yzed for	
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65-						
				REM	IARK S	
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70-	1	•	•		•	
				SOIL DESCRI		
				Trace 0-10%	C-Coarse	Br-brown
	Į.		•	Some 10-40%	M-Medium	Bl-black
	j		•	And 40-50%	F-Fine	Y-yellow
			•			T-tan
75-	inaner.			المراجعة الرائد الأورانية الأورانية الأورانية الم	جه در کار خدد	Gr-grey
1 00 yclot	n kahai			ecology and en	vironment, inc.	R-red

Well Log # 128 Project Name Woburn Well Survey Project # TDD F1-8010-03A Date Prepared 11/30/81 Prepared By M. Hanley

R-red

epth, Ft. (M		Well No. E44 (Boring) .
	Blow Counts/6"	Location Woburn, MA
_		Owner MDC
		Ground Elev. 106'2" MSL
		Driller Guild Drilling Co.,
		Drilling Completed 8/11/81
		Type of Rig Truck Mounted
20:		
0 0	Br. F-M sand, some F-M gravel	Well Diam.
000		Depth 36' 3"
		Screen Diam.
. 0		Screen Setting
0.0	Br. F-M sand and gravel, trace rock	Screen Type
.0,0	or boulder fragments.	
0.0	or bounder fragments.	Well Type Boring
0.0		Static Water Level
x x 🐒 X X	·	
x x		Date Measured
X X 🔯 X X		WATER QUALITY
X X		Samples Taken Yes No X
XXXXX		No. of Samples
X	•	Type of Samples
X X X X		
<`x	•	D-A- C- 1-1
,×,		Date Sampled
` ^ * * * *		Samplers
×		Will be Analyzed for
^ ^ ***		
X		
XX		
, X		
X X X X		
UX Y	Bedrock	
X X X X X	- Loui Ock	
× × × ×		
· · · · · · · · · · · · · · · · · · ·		
	•	
$X = X \times X$		
` '		
$\times \times $	•	
\mathbf{x}^{\prime}	•	REMARKS
(^x = x^X		Boring Log Courtesy of Haley
X		& Aldrich, Inc., Cambridge, MA
(X = X X		
x X		
X X EE X X		
x X		SOIL DESCRIPTION ABBREVIATIONS
× × × × ×		
x X		Trace 0-10% C-Coarse Br-brown
(X X X X	·	Some 10-40% M-Medium B1-black
X X X		And 40-50% F-Fine Y-yellow
		T-tan
x X		Gr-grey

Well Log # 129
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description	Well No. E 45 (Boring)
5, 7		WELL NO (DOLLING)
41.12	Blow Counts/6"	Location Woburn, MA
51.10	·	
41 17		Owner MDC
		Ground Elev. 122.8' MSL
		Driller Guild Drilling Co. Inc.
		Drilling Completed 8/14/81
		Type of Rig Truck Mounted
		WELL DATA
	Topsoil and fill	Well Diam.
$XXX \otimes XXX$	· ·	Denth 54
0 - 0		
0		Screen Diam.
O 8 O	GrBr., F-C sand and gravel, some	Screen Setting
0.	silt, rock/boulder fragments	Screen Type
0		Well Type Boring
		Static Water Level
0		Date Measured
700		WATER QUALITY
Y Y X X		Samples Taken Yes No X
^x`		No. of Samples
X _X X	Boulder	Type of Samples
x x × x ×	•	Type of Samples
0	Br. F-C sand trace F gravel and cobbl	les
0	_	Date Sampled
XXXX		Samplers Samplers
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XX XX		
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X = 3 1		Boring Log Courtesy of Haley
		& Aldrich, Inc. Cambridge, MA
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(SOIL DESCRIPTION ABBREVIATIONS Trace 0-10% C-Coarse Br-brown Some 10-40% M-Medium B1-black
X X	•	SOIL DESCRIPTION ABBREVIATIONS Trace 0-10% C-Coarse Br-brown Some 10-40% M-Medium B1-black And 40-50% F-Fine Y-yellow
X X X X X X X X X X X X X X X X X X X		SOIL DESCRIPTION ABBREVIATIONS Trace 0-10% C-Coarse Br-brown Some 10-40% M-Medium B1-black

APPENDIX B

Analytical Conditions for the Volatile Organic Analyses

Performed at the U.S. EPA Laboratory

in

Lexington, Massachusetts

on

November 4, 5, 1981

Well Log # 129
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

			Tropated 25 in. Hantey
Depth, Ft.	(M)	Soil Description	Well No. E45 .
	·	Blow Counts/6"	Location
			Owner
	x,×		Ground Elev.
XXX	x x		Driller
^^	^x^		Drilling Completed
	x x		Type of Rig Truck Mounted
X	X		WELL DATA
o X X	x x		Well Diam.
X	X		11Anth
	X X	•	Screen Diam
X	X X Bedrock		Screen Setting
, , ,	x'		Screen Type
X X X	×X		Screen Type
5- ^ x	x		Well Type
x x	x x		Well Type Static Water Level
X	x		· · · · · · · · · · · · · · · · · · ·
XX	x x		Date Measured
X	X		WATER QUALITY
	XX	•	Samples Taken Yes No
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X X X	xx		Date Sampled
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~	1		SOIL DESCRIPTION ABBREVIATIONS
, , ,			Trace 0-10% C-Coarse Br-brown
	·	•	Some 10-40% M-Medium Rl-black
		•	Some 10-40% M-Medium Bl-black
		•	And 40-50% F-Fine Y-yellow
5-		•	

Date: Nov. 16, 1981

Subject: Wohun - 128 VOA

From: Elio Go Ri & Meria Sataille

Sent to John Hache. Via Ray Thompson 11/12/81 Analytical Procedure: Ed Ry Vol 44 233 Dec. 3, 1979

Method of Quantitation: Internal Std using response factors

Date Samples Received by Laboratory: Nov. 2, 1981

Nov 4-5 1981 Date Samples Analyzed:

Additional Comments:

Analytical Conditions for the Purgeables

Instruments:

Tekmar LSC-1 HP-5985

Purge Conditions:

Gas:

Purge Time and Flow:

Trap:

Desorption Time, Flow, Temperature:

Bake out cycle:

Helium

12 min, 40 ml/min

Six in stainless steel (1/8 in OD) packed with 15 cm 60/80 mesh Tenax-GC plus 8 cm 35/80 mesh Davison type 15 Silica Gel

4 min, 20 ml/min, 180°c

7 min

Chromatographic Conditions:

Column:

Eight ft stainless steel (1/8 in OD) packed with 0.2% Carbowax 1500 coated on 60/80 mesh Carbopack C preceded by a 1 ft stainless steel column (1/8 in OD) packed with 3% Carbowax 1500 coated on 60/80 mesh Chromosorb W

Three min isothermal at 25°c then 10/min to 170°c held for

a total time of 45 min

off, 275 °c, 275 °c

Helium, 30 ml/min

Program:

Injector, Separator, Transfer Temperatures:

Carrier Gas and Flow:

Mass Spectrometer Conditions:

Electron Energy:

Mass Range:

Emission Current:

Scan Rate:

70 V

260 AMU

.0.3 ma

12,8 msec/amu